Supreme Court of the United States

OCTOBER TERM, 1926

No. 709

EASTMAN KODAK COMPANY, EASTMAN KODAK COMPANY OF NEW YORK, AND EASTMAN KODAK STORES, INC., PETITIONERS,

vs.

CHARLES B. GRAY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE THIRD CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 4, 1926.

CERTIORARI GRANTED FEBRUARY 1, 1926.

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1933

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EASTMAN KODAK COMPANY, EASTMAN KODAK COMPANY OF NEW YORK, AND EASTMAN KODAK STORES, INC., PETITIONERS,

vs.

CHARLES B. GRAY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE THIRD CIRCUIT.

VOL. II

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JUDD & DETWEILER (INC.), PRINTERS, WASHINGTON, D. C., FEBRUARY 15, 1934

—4580-C

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United States patent to Jenkin & Underwood No. 1,297,327
British patent to Watson & Edwards No. [illegible] of 1905
British patent to Edwards & Watson No. [illegible] of 1905
British patent to Edwards & Watson No. [illegible] of 1906
German patent to Wegmann No. 147,372
Translation of specification of above German patent
Clerk's certificate

1,314,867.

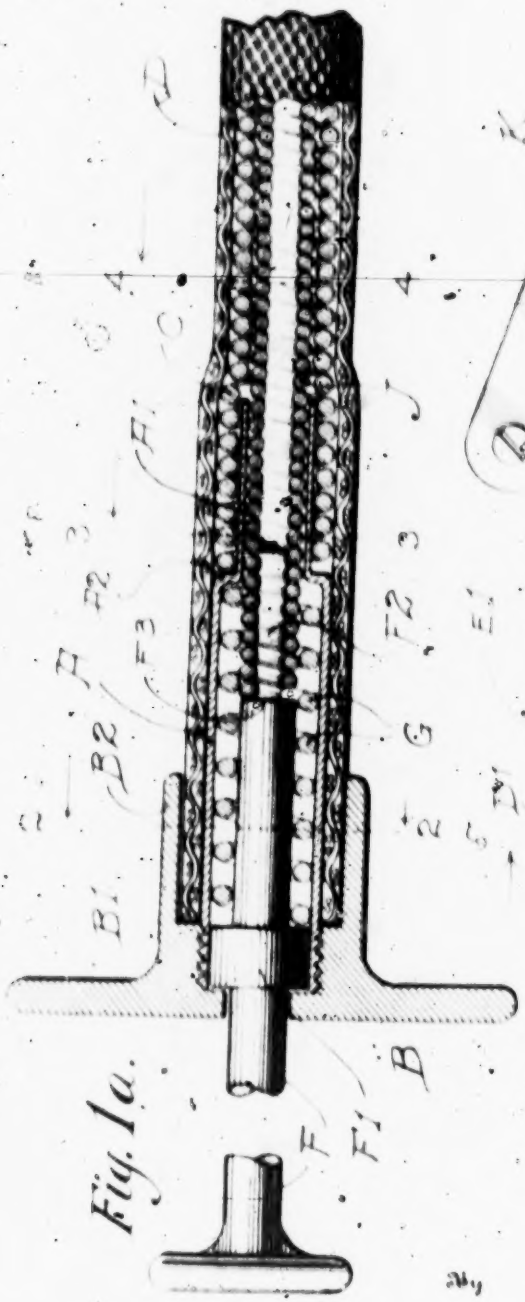


Fig. 1a.

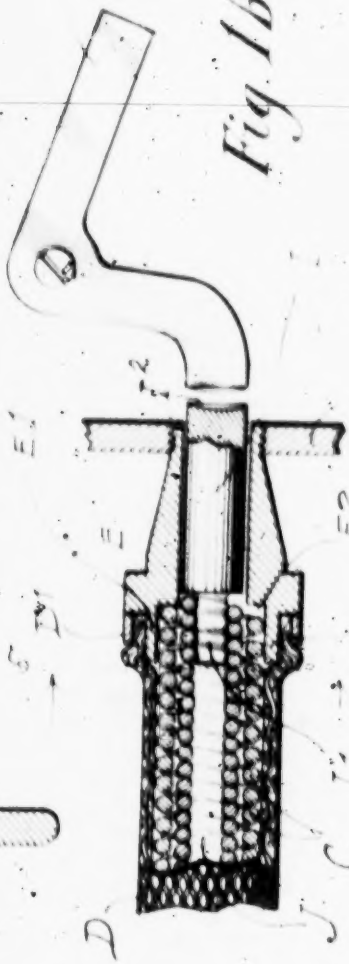


Fig. 1b.

Inventor
Charles B. Gray,
Cyrus Miller
Attorney

C. B. GRAY.
POWER TRANSMITTING MECHANISM.
APPLICATION FILED JUNE 7, 1918.

1,314,867.

Patented Sept. 2, 1919.

Fig. 3

Fig. 4

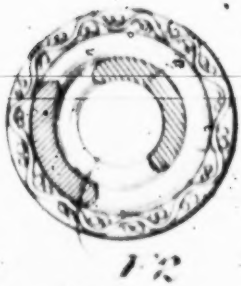


Fig. 2.

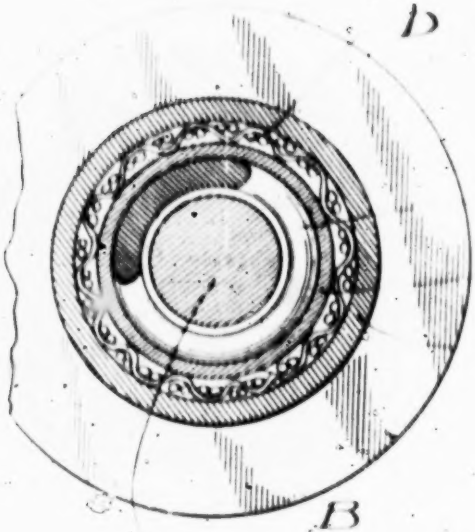
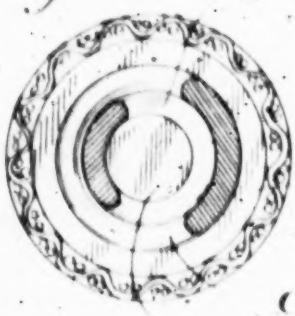


Fig. 5



G
H
B2

Inventor
Charles B. Gray,
By Cyrus Keller
Attorney

UNITED STATES PATENT OFFICE.

CHARLES B. GRAY, OF KNOXVILLE, TENNESSEE.

POWER-TRANSMITTING MECHANISM.

1,314,867. Specification of Letters Patent. Patented Sept. 2, 1919.

Application filed February 7, 1918. Serial No. 216,885.

To all whom it may concern:

Be it known that I, CHARLES BAXTER GRAY, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented a new and useful Improvement in Power-Transmitting Mechanism, of which the following is a specification, reference being had to the accompanying drawing.

My improvement relates particularly to mechanism for transmitting power through endwise reciprocation of a member of the mechanism. The mechanism is applicable for use as actuating means for the shutters of cameras, and as an actuating or releasing means for various kinds of apparatus.

The object of the invention is to produce such a transmitting mechanism in flexible form permitting repeated bending without injury to the mechanism, and in a form permitting the attainment of precise movement.

In the accompanying drawings,

Figures 1ª and 1ᵇ together present a longitudinal view of a mechanism embodying my improvement, portions being in section;

Fig. 2 is a section on the line, 2—2, of Fig. 1, looking toward the left;

Fig. 3 is a section on the line, 3—3, of Fig. 1, looking toward the left;

Fig. 4 is a section on the line, 4—4, of Fig. 1, looking toward the left;

Fig. 5 is a section on the line, 5—5, of Fig. 1, looking toward the right.

Referring to said drawings, A is a metallic tube or barrel having its left hand end screw-threaded into the contracted portion, B^1, of the outer head, B, whereby said barrel and said head are firmly but detachably joined to each other. The opposite end of said barrel is contracted to form a neck, A^1. At the junction of said neck with the body of said barrel is a shoulder, A^2. A stem, F, extends slidably through the head, B.

Within said head, the stem has an annular rib, F^1, which limits the movement of said stem toward the left or away from the neck, A^1, of the barrel, A. Between said annular rib and the shoulder, A^2, the stem, F is surrounded by an expanding coiled spring, G. Said spring abuts against the shoulder, A^2, and against the rib, F^1, and tends to move the stem, F, toward the left or away from the neck, A^1, so that; when said stem is free from pressure on its outer end in the direction of the barrel, the stem is held outward with the rib, F^1, bearing against the inner face of the wall of the head, B^1.

The neck, A^1, is loosely surrounded by the left hand end of a coiled spring wire tube, C. The right hand or inner end of said spring extends into an inner head, E. Said inner head has a tubular neck, E^1, in which is an annular shoulder, E^2, against which said spring abuts. Said spring rests loosely within said head. The head, B, and the head, E, are joined by a fiber fabric tube, D. At its left hand end, said fabric tube surrounds the barrel, A, and the head, B, has a tubular extension, B^2, surrounding said fabric tube. The fabric is secured to the barrel, A, by means of a suitable adhesive. At the right hand end, the fabric tube surrounds the neck, E^1, on the head, E, and a band, D^1, surrounds the fabric tube and binds the latter to said neck.

The coiled spring wire tube, C, is so wound as to leave spaces between the coils, and said tube is made long enough to cause it to be under compression endwise when the fiber fabric tube is under tension. Thus the fiber fabric tube is normally held under tension and the coiled spring wire tube, C, is normally exerting endwise pressure. And the fiber fabric tube limits the endwise expansion of said wire tube. The length of the fiber fabric tube and the coiled wire tube, C, and the spacing between the coils of the tube are so proportioned as to still leave spaces between the coils of the tube, C, when the latter is held under restraint by the fiber fabric tube against full endwise expansion. The spaces thus left between the coils of the tube, C, are sufficient to allow approach of adjacent coils toward each other at the inner side of the curve while there is limited or substantially no expansion of the coils at the outer side of the curve when the tube is bent.

On the inner or right hand end of the stem, F, is a neck, F^2, at the base of which is an annular shoulder, F^3. Said neck is surrounded by one end of a coiled wire tube, J. The opposite or right hand end of said tube extends around a neck, I^1, on a slide member, I, which is slidable endwise in the

head, E. The engagement between the tube, J, and the necks, F^2 and I^1, may be frictional; but said necks are preferably screw-threaded to conform approximately to the coils of the tube, J, in order that said tube may be threaded to said necks. The tube, J, is preferably so formed as to cause its coils to normally press firmly against each other, in order that there may be no lost motion when the stem, F, is pressed inward, in the direction of the head, E, the stem, F, pushing the tube, J, and the tube, J, pushing the slide member.

The slide member, I, may be regarded as the final member in the transmission. In the particular form shown in the drawings the outer end of said member has a concave face, I^2, adapted to bear against a pivoted member, K, which is to be moved by the outward movement of the slide member, the head, E, being screwed into a relatively stationary wall, L, and thus held in relation to the member, K.

The coils of the tube, C, are wound in one direction while the coils of the tube, J, are preferably wound in the opposite direction.

As above described, the tube, J, is held to the neck, F^2, of the stem, F, and the slide member, I, is held to the tube, J, by means of the neck, I^1. After unscrewing the head, B, from the barrel, A, the stem, F, together with the spring tube, J, and the slide member, I, may be drawn out endwise, toward the left, through the barrel, A, the diameter of the tube, J, and the slide member being of less diameter than the interior diameter of the tube, C.

The fabric tube, D, may be detached by removing the band, D^1, and softening or dissolving the adhesive by which said fabric is secured to the barrel, A.

This mechanism comprises two important features. One of these is the closely-wound coiled wire transmission tube, J, connected with the stem, F, and the slide member, I, whereby there may be transmission without lost motion. The other of these features is the forming of the outer coiled wire tube, C, in such manner as to permit bending the tube without material separation of the coils at the outer side of the curve, the spacing between the coils permitting the coils to approach each other on the inner side of the curve while the tube is being bent. The member, I, being free to slide, the adjacent end of the inner wire tube, J, is free to move endwise when the mechanism is being bent. In this manner, the inner tube, although closely-wound, adapts itself to the bending without kinking.

Practice has shown that a mechanism of this construction may be bent an indefinite number of times without kinking or otherwise disabling the coiled wire tubes.

The reach of the slide member, I, may be adjusted by moving the tube, J, on both or either of the necks, F^2 and I^1. In this manner a very precise adjustment may be made.

The size of the mechanism is to be varied to conform to the amount of power to be transmitted and to the size of the apparatus with which the transmission mechanism is to be associated. For some purposes the mechanism may be as large or larger than shown by the drawings. For example, in power-driven vehicles, the mechanism may be made large and used for power transmission to some point distant from the driver, the stem, F, being used as a pedal.

I claim as my invention,

1. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head, a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

2. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head, a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

3. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and adjustably surrounding said stem and said slide

member for the transmission of endwise motion from said stem to said slide member, substantially as described.

4. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from the stem toward and to the slide member, the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head, said intervening means and said slide member and said stem are together removable, substantially as described.

5. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

6. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and threaded to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

In testimony whereof I have signed my name this 1st day of February, in the year one thousand nine hundred and eighteen.

CHARLES B. GRAY.

6

5'

6/21/13.

Mr.H.M.Fell,

% Eastman Kodak Co.,

Rochester, N.Y.,

Dear Harry-

I am enclosing a photograph taken of a cable release. I have a little device in that line, as you will notice, that is non-kinkable. We understand that those that are now being used have been giving trouble more or less by the cable getting a kink in it which usually interferres with the working of the shutter, especially is it so with a time exposure where the kink resists the spring and does not close the shutter, usually fogging the picture.

We have used a device like this for several months to try out before we considered putting it on the market and we find that it is correct in every way. It is as flexable as the old rubber tubing, but in this of course there is no rubber used to deteriorate.

This photograph shows clearly how it can be doubledup without being kinked or injured in any way. They can be made somewhat cheaper than the present ones manufactured.

We thought before organizing a company to put these on the market, we would see if the Eastman Company would be interested in it. I'll thank you to talk the matter over with them.

We believe that nearly all the faults people have found with the Kodak can be attributed to these cable releases which get kinked. This one we have reduces that difficulty to a minimum.

Let us hear from you as soon as convenient, and with very best wishes for you and yours,

Your friend,

Plaintiff's Exhibit 4

13

EASTMAN KODAK COMPANY

ROCHESTER, N.Y.

June 24, 1918.

Mr. Joseph Knaffl,

c/o Knaffl & Bro.,

Knoxville, Tenn.

My dear Joe:

Yours of the 21st, enclosing photograph of a camera cable release, is just at hand.

Needless to say, we are always interested in anything of this kind and I am going to suggest that you send the device on to me, as we would very much like to try it out. No doubt your patents are in such shape that you are fully protected, so there would be no trouble along this line. If you will do this, we will be glad to investigate the matter further.

Very truly yours,

Hiller Fell

FG

Plaintiff's Exhibit 5

P6
The

8

7/2/18.

Mr,H.M.Nell,

% Eastman Kodak Co.,

Rochester, N.Y.

Dear Harry-

We sent the little release in yesterday's mail. You will notice that this has been used considerably from the wear on the outside of the braid. This has been used for several months on a No.1 Autographic Special Kodak.

This little devise has been handled pretty rough. When this work is all done by machinery they will make a much neater appearance and do even better work than this one has done. We believe that it has solved the problem of the release troubles.

We have shown this to quite a number of kodakers and they seem to like it very much indeed.

Attach this to one of the kodaks mentioned above and try it out, You will notice that it makes no difference how much you bend it or kink it. Then let us know what the Eastman Company thinks about it.

Thanking you for the kindness shown us,and with very best wishes,we are,

Yours very truly,

Plaintiff's Exhibit 6

EASTMAN KODAK COMPANY

ROCHESTER, N.Y. July 10, 1918.

Mr. Joseph Knaffl,
C/o Knaffl & Bro.,
Knoxville, Tenn.

Dear Sir:-

Mr. H. M. Fell, to whom you sent your letters of June 21st and July 2nd, has referred them to the writer. We find that this release is identical in practically every respect with the release which we have been marketing for some time. For a very considerable period we have been experimenting with such a release and are familiar with this type of construction.

Inasmuch as you mention having the matter of organizing a Company to market this device in your mind, it might interest you to know that we are perfecting our patents covering this construction. We are taking the liberty of sending you one of our releases together with the release which you so kindly sent us for examination.

We wish to thank you for your thoughtfulness in giving us an opportunity to consider your release and hope that, in the future, you will submit to us any photographic devices that you have in mind.

Yours very truly,

EASTMAN KODAK COMPANY,

By T. W. Langsdorf

General Manager Mfg. Depts.

HRA/MEM

Plaintiff's Exhibit 7

10

F. 1675.

595:53

CYRUS KEHR
COUNSELLOR AT LAW
801 Bowers Building
KNOXVILLE, TENNESSEE

PATENT, TRADE-MARK
COPYRIGHT AND CORPORATION LAW

WASHINGTON OFFICE
908 9TH STREET

Re file 3796

Knoxville, Tenn. Sept. 26, 1919

Eastman Kodak Company,
Rochester, N. Y.

Mr. Stinchfield
How about it?
F.W.L.

Gentlemen:

Allow me to bring to your attention U. S. patent, No. 1,314,867, granted to Charles B. Gray, of Knoxville, Tennessee, Sept. 2, 1919, for an improvement in Power Transmitting Mechanism.

We note that you are marketing cable releases covered by this patent, and we ask whether you desire to make an adjustment without suit.

Let me say further, that my client's device is the first practical device of this kind, and he and those associated with him are planning arrangements for manufacture, and they will naturally want the field to themselves.

Very truly yours,

Cyrus Kehr

EASTMAN KODAK CO.
SEP 30 1919
PATENT DEPT.

Plaintiff's Exhibit 10

P 11

COPY

Oct. 6, 1919

Mr. Cyrus Kehr,
807 Empire Bldg.,
Knoxville, Tenn.

Dear Sir:-

We find upon full investigation that none of the cable releases manufactured by us infringes U.S. patent No.1,314,867, Gray.

More than two years before the Gray application was filed we made and sold in this country large quantities of cable releases having the same general combination of parts as our present ones, including a sleeve or barrel, screwed into the outer head and engaged by a close coiled wire casing or tube. Not only is the use of an open coiled spring tube in place of the closed one non-inventive in view of the Edwards patents cited against Gray and in view of cable releases imported into this country before Feb. 7, 1913 by the foreign owners of the Edwards patents, but we ourselves substituted and tested for our own satisfaction the open coil spring in our standard cable releases before Mr. Gray entered the field.

Obviously anybody in this country can use an inner coiled thrust member in view of the cited German patnt No. 147,572, Wermann. We do not attach such thrust member to the other parts by threads, as Gray does, but by the same device that we have employed for years (and before Feb.7, 1916) in connection with our former thrust members.

With regard to the last paragraph of your letter, we know from our own experience that literally hundreds of thousands of practical cable releases have been sold for many years and used with satisfaction all over the world.

Yours truly.

RLS-MD Plaintiff's Exhibit 11 Patent Attorney.

P 2 P 12

EASTMAN KODAK COMPANY

ROCHESTER, N.Y. December 3, 1919.

Mr. Joseph Knaffl,
Knaffle & Brother,
Knoxville, Tann.

Dear Sir:

Mr. Fell handed us your letter of November 18th and since that time we have been reviewing the matter. We find that our Patent Department, under date of October 6th, wrote to Mr. Cyrus Kehr of Knoxville, in response to his letter of September 26th calling our attention to the Gray patent and implying that suit would be brought unless adjustment was made. We have heard nothing further from Mr. Kehr in this matter, and assumed that the statements of our attorney had disposed of his contention that we were infringing the Gray patent. Possibly this letter of ours to Mr. Kehr has not been brought to your attention and, therefore, we enclose a copy for your information.

To review the matter again, the facts are these: The cable release which you sent us with your letter to Mr. Fell of June 21, 1918, was like a cable release which we had marketed many years previously, except in two features: First, the coils of the flexible casing were open, or separated, so as to give a spring effect; second, the inner thrust member, instead of being composed of twisted strands, was itself a miniature coiled tube. At the time we received your sample we were familiar with both of these ideas, and, therefore, did not regard them as new. As to the first feature, we have written evidence of our knowledge of this at least two years before the receipt of your sample. As to the inner coil thrust

member, our knowledge of this feature is proved by our patent No.1,297,327 to Dakin, March 18, 1919. This patent shows this feature, and the filing date of October 15, 1917, is, as you will note, eight months before your first letter to Mr. Fell. We abandoned, however, claims to this feature because it had been clearly shown in a prior German patent, No.147,573 to Wermann.

If you will refer to the writer's letter to you of July 10, 1918, you will note that we referred to the similarity of the release we were then marketing and the Gray release, and sent you a sample, and, furthermore, we at the same time told you that we had already applied for patent.

We trust that a careful review of the facts above cited will convince you that there is neither any ethical nor legal responsibility on our part for violation of the claims of the Gray patent.

If there is anything in our statement that is not clear to you, we would be very glad to amplify it.

Yours very truly,

EASTMAN KODAK COMPANY,

F. W. Lovejoy

F. W. Lovejoy
Vice President.

Plaintiff's Exhibit 12 (continued)

F.1675

EASTMAN KODAK COMPANY

ROCHESTER, N.Y.

October 31, 1925.

Mr. C. B. Gray,
Box 596,
Philadelphia, Pa.

Dear Sir:

Since your call upon us a few days ago, we have given careful consideration to your U. S. patent No.1,314,867, September 2nd, 1919. Because of the circumstances outlined in detail to you by Mr. Stewart of our Patent Department, we find that we must adhere to the opinion that our cable releases do not infringe any valid claims of your patent.

On June 21st, 1918, one of your cable releases embodying the construction mentioned in the above patent was sent to us by Mr. Knaffl. This cable release we found to be similar to cable releases which we had made and marketed for several years except for two features, both of which were not original with you. First, the flexible casing included an open coil spring, and second, the plunger of the cable release consisted of a closed coil spring. We knew of the open coil spring before your cable release was submitted to us as is shown in the following United States patents:

828,815	Edwards,	August 14, 1906
929,573	"	July 27, 1909

The use of a closed coil spring thrust member is shown in our U. S. patent No. 1,297,327, Dakin, et al., March 18th, 1919. We filed a patent application for this device October 15th, 1917, eight months before your cable release was submitted to us.

Plaintiff's Exhibit 13

Claims to this closed coil spring thrust member were abandoned because of its being shown in an old German patent No. 147,572, Werman, May 28th, 1902.

We feel that the circumstances outlined above furnish convincing evidence that the cable release which you submitted to us differed from those which we had had on the market for years only in these two ways, and that cable releases embodying the construction constituting these two differences are clearly shown in the prior art.

We hope that, after you have had an opportunity to review these matters with your attorney, you will agree with us in believing that our contentions are correct. Meanwhile we wish to thank you for the courteous way in which you have approached us on this subject.

Yours very truly,

AKC/JC

EASTMAN KODAK COMPANY

Manufacturing Department

By A K Chapman

Plaintiff's Exhibit 13 (continued)

CW 131

SPECIFICATION AND LIST OF PARTS FOR FACTORY ORDER NO.

EASTMAN KODAK CO.

9435

APR 15 1929

FOR 50,000 #2 cable rel.

1. rel 4/15/29 Dean

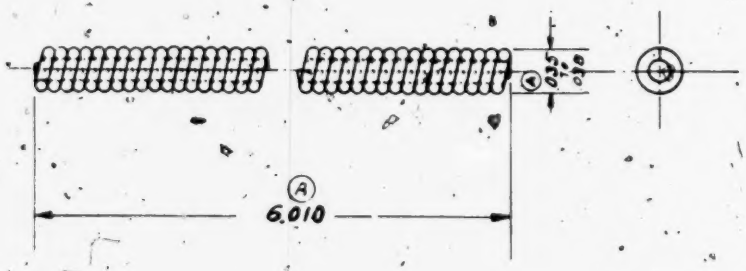
PART NO.	NAME OF PART AND MATERIAL	USED ON MODEL	QUANTITY REQUIRED	SURPLUS APPLIED	QUANTITY ORDERED	REMARKS
9500	outside casing	1	52500		52500	✓
10185	plunger cap	1	52500		STOCK	✓
10191	operating sprg. sleeve cap	1	52500		STOCK	✓
14511	cable	1	52500		52500	✓
14517	operating plunger	1	52500		STOCK	✓
14519	cable end	1	52500		STOCK	✓
14523	shutter plug	1	52500		STOCK	✓
23788	operating sprg. sleeve	1	52500		STOCK	✓
23789	shutter plug sleeve	1	52500		STOCK	✓
23791	spring casing	1	52500		52500	✓
	{ASSEM PARTS}					
18393	cable with plunger	1				
15132	cable rel. complete	1				

Plaintiff's Exhibit 36

USED ON
№ 2 - 7" CABLE RELEASE.

223

Ⓑ NOTE: CLOSE WOUND - LEFT HAND.



CABLE.

CHANGE NO.	CAMERA WORKS - E. K. CO. CHANGES	DATE	BY
91-B	Ⓐ was 6.180	9-13-17	
1319	Mat. was .030 (.0287) Piano Wire	3-3-21	
958-A	TOLERANCE ADDED TO "A"	12-22-22	JC
4307	MATL WAS .0098 PIANO WIRE	8-14-28	PT
5321-B	NOTE Ⓑ ADDED	12-22-30	

SCALE	DES BY APV'D BY
DRAWN BY	O. M. H. DATE 4-14-17
CHECKED BY	J.E.S. APV'D BY
MATERIAL	.0098 SPECIAL MUSIC WIRE
PART NO DRAWING	14511

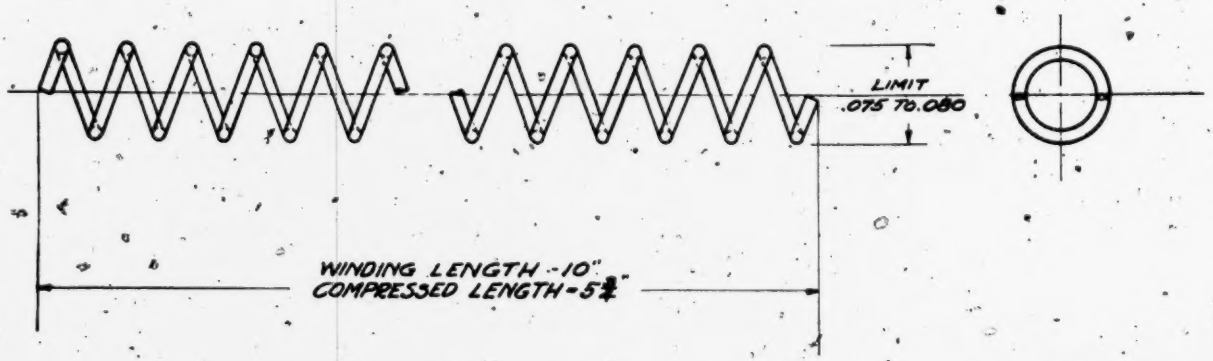
Plaintiff's Exhibit 37

17

23791

Ex. 27
KMK
12/4/31

USED ON
#2-7" CABLE RELEASE



NOTE:
APPROX. 20 TURNS PER. IN.

SPRING CASING

CHANGE NO.	CAMERA WORKS - E. K. CO. CHANGES	DATE	BY

DRAWN BY Siegfried DATE 12-26-24
TRACED BY Siegfried DATE 12-26-24
CHECKED BY Veitch APV'D BY
MATERIAL #28 (.014) BRASS WIRE
2432

No. 23791

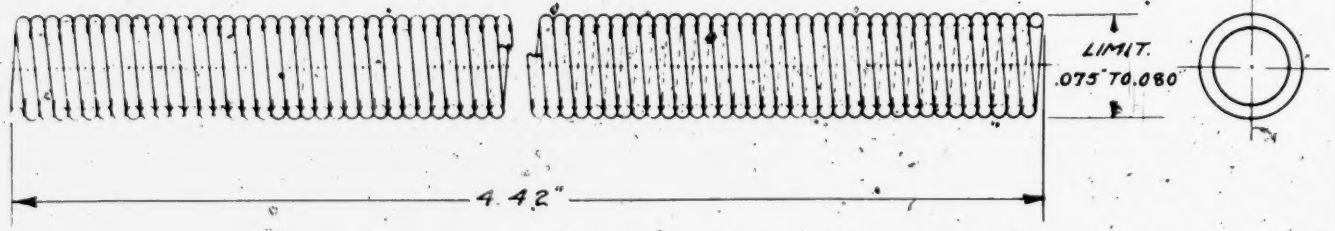
Plaintiff's Exhibit 38

824
18

225

P 39.

USED ON
.7" CABLE RELEASE
#18"2 BALL BEARING SHUTTER.



SPRING CASING.

CAMERA WORKS-E. K. CO.			
CHANGES		DATE	BY
REDRAWN	H. S.	10-10-44.	

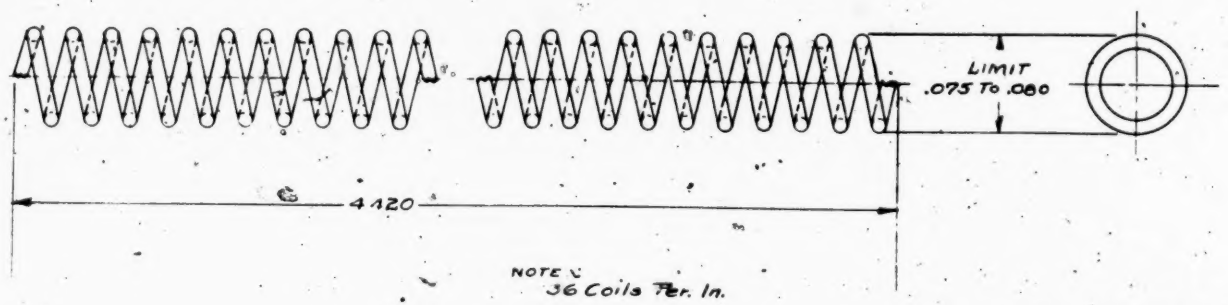
SCALE	10 TIMES SIZE.
DRAWN BY	H. S. DATE 11-26-13.
CHECKED BY	APV'D BY
MATERIAL	BRASS WIRE #30 .011" DIA.
PART NO DRAWING	9507-

Plaintiff's Exhibit 39

19

Plaintiff's Exhibit 40

USED ON
2.7" CABLE RELEASE



NOTE:
36 Coils Per. In.

SPRING CASING

CHANGE NO.	CAMERA WORKS-E. K. CO.		
	CHANGES	DATE	BY
	Mat. Was #30 (.011) BR. W	10-22-20	

SCALE	DESIGN APV'D BY
DRAWN BY S. E.	DATE 5-8-18
CHECKED BY J. E. S.	APV'D BY
MATERIAL #20 (.040) Brass Wire	
PART NO	
DRAWING	15131

20

220

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EASTMAN KODAK COMPANY

CAMERA WORKS

ROCHESTER, N. Y.

Page NO. 1

List of Parts to Make One Complete NO.2-7" CABLE RELEASE 1 B.B. FOR 1A JR. 1A AUTO

DATE 5/21/18 3 F.P.K. - 2 B.B. FOR 3A F.P.K. 20 & 3A FOLD- BROWNIE

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
~~9507~~	SPRING CASING			1
	BRASS WIRE NO.30	.011	PURCHASED	
9509	OUTSIDE CASING			1
	LINEN SLEEVING		PURCHASED	
10185	PLUNGER CAP			1
	BRASS ROD	9/32"		
10491	OPERATING SPRING SLEEVE CAP			1
	BRASS ROD	7/16"		
12891	OPERATING SPRING SLEEVE			1
	BRASS TUBE	.125 OUTSIDE DIA.	.085 INSIDE DIA	
14511	CABLE			1
	PIANO WIRE NO.00	0087"		
14515	SHUTTER PLUG SLEEVE			1
	BRASS ROD	1/8"		
14517	OPERATING PLUNGER			1
	BRASS ROD	3/32"		
14519	CABLE END			1
	BRASS ROD	066		
14521	OPERATING SPRING			1
	MUSIC WIRE	NO.0 .0093 B & S. GAUGE		
14523	SHUTTER PLUG			1
	BRASS ROD	7/32"		

Offd Ex 43

APR 12 1920

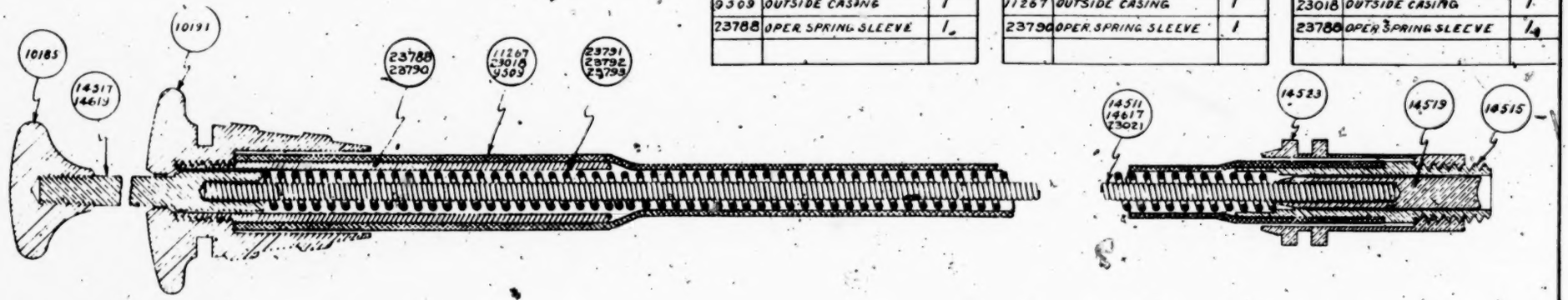
Plaintiff's Exhibit 43

USED ON No 20-7 CABLE RELEASE		
PART NO.	NAME	NO IN GROUP
15132	CABLE RELEASE	1
14674	SELF TIMER CABLE RELEASE BRACKET	1
15129	SET SCREW	1

USED ON No 2-7 CABLE RELEASE		
PART NO	NAME	NO IN GROUP
14511	CABLE	1
10185	OPER. PLUNGER CAP	1
14517	OPERATING PLUNGER	1
10191	OPER SPR & SLEEVE CAP	1
23791	SPRING CASING	1
23789	SHUTTER PLUG SLEEVE	1
14519	CABLE END	1
14523	SHUTTER PLUG	1
9309	OUTSIDE CASING	1
23788	OPER SPRING SLEEVE	1

USED ON 13-3 CABLE RELEASE		
PART NO.	NAME	NO IN GROUP
14617	CABLE	1
10185	OPER. PLUNGER CAP	1
14619	OPERATING PLUNGER	1
10191	OPER. SPRG. SLEEVE CAP	1
23792	SPRING CASING	1
23789	SHUTTER PLUG SLEEVE	1
14519	CABLE END	1
14523	SHUTTER PLUG	1
11267	OUTSIDE CASING	1
23790	OPER SPRING SLEEVE	1

USED ON 16-8 CABLE RELEASE		
PART NO.	NAME	NO IN GROUP
23021	CABLE	1
10185	OPER. PLUNGER CAP	1
14517	OPERATING PLUNGER	1
10191	OPER SPRG. SLEEVE CAP	1
23793	SPRING CASING	1
23789	SHUTTER PLUG SLEEVE	1
14519	CABLE END	1
14523	SHUTTER PLUG	1
23018	OUTSIDE CASING	1
23788	OPER SPRING SLEEVE	1



No 20-7 CABLE RELEASE Construction No 15297
No 2-7 CABLE RELEASE Construction No 15132
No 13-3 CABLE RELEASE Construction No 15154
No 16-8 CABLE RELEASE Construction No 23020

CHANGE NO.	CAMERA WORKS-E.K.CO. CHANGES	DATE	BY
5321	REVISED PART LIST FOR 2-7 CABLE RELEASE & PART NOS.	5-2234	L.T.J.

CHANGE NO.	CAMERA WORKS-E. K.CO. CHANGES	DATE	BY
477	No 20-7" CABLE RELEASE Construction 6189 added	9-28-18	
477	No 20-7" WAS 15189	5-13-20	
2097	No 16-8 - 23020 WAS 23129 - 15160	11-7-23	J.C.
2432	REVISED TO AGREE WITH CHANGE IN OPERATING SPRING	12-28-23	J.C.
4419	PART LIST FOR 2-7 & 20-7 CABLE RELEASES ADDED.	10-16-28	

SCALE — DESN. APV'D BY
DRAWN BY O.M.H. DATE 5-14-18
CHECKED BY J.E.S. APV'D BY
MATERIAL
PART NO
DRAWING 15132

Plaintiff's Exhibit 44

D-1

Defendant's exhibit No. 1

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper, Contents and Drawings, in the matter of the

Letters Patent of

Charles B. Gray,

Number 1,314,867, Granted September 2, 1919,

for

Improvement in Power-Transmitting Mechanism.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this eighth day of October, in the year of our Lord one thousand nine hundred and thirty-one and of the Independence of the United States of America, the one hundred and fifty-sixth.

ATTEST:

Chief of Division.

Thomas E. Robertson
Commissioner of Patents.

24-a

232

NUMBER (Series of 1915) 4 **1918** (EX'R'S BOOK) 170 - 25

DIV. 12 **PATENT No.** 1314867

Charles B. Gray,

of Knoxville,
County of
State of Tennessee,
Invention Power Transmitting Mechanism

PARTS OF APPLICATION FILED	ORIGINAL	RENEWED
Petition	February 7, 1918	, 191
Affidavit	" " , 1918	, 191
Specification	" " , 1918	, 191
Drawing 2 Shts	" " , 1918	, 191
Photo Copy	, 191	, 191
First Fee Cash $15	Feb 7, 1918	, 191
" " Cert.	, 191	, 191
Appl. filed complete	Feb 7, 1918	, 191
Examined and Passed for Issue	Feb 4, 1919	, 191
Ex. Div.	12	Ex. Div.
Issue Fee	Feb 6, 1919	, 191
Allowed	Aug 5, 1919	, 191
Final Fee Cash	, 191	SEP 2 1919 , 191
Patented		, 191

Attorney Cyrus Kehr, Empire Bldg Knoxville, Tenn.

Associate Attorney

Division of Pat. No.

Final Claims Allowed 6 Print Claims 10 in O. G. (Cl. 64)

Allowed Power Transmitting Mechanism

24-b

U. S. PATENT OFFICE

To the Commissioner of Patents:

5709

Your petitioner, Charles Baxter Gray, a citizen of the United States and resident of Knoxville, in the County of Knox, and State of Tennessee, and whose post-office address is 1849 Armstrong Ave., Knoxville, Knox County, Tennessee, prays that Letters-Patent may be granted to him for the improvement in

Power Transmitting Mechanism

set forth in the annexed specification.

And he hereby appoints CYRUS KEHR, of Knoxville, State of Tennessee, (Registry No. 2286), his attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Signed at Knoxville, County of Knox, State of Tennessee, this 1st day of February 1918

Charles B. Gray

Witnesses

[redacted]

Specification

To all Whom it May Concern:

Be it known that I, Charles Baxter Gray, a citizen of the United States, residing at Knoxville, in the County of Knox and State of Tennessee, have invented a new and useful improvement in Power-Transmitting Mechanism, of which the following is a specification, reference being had to the accompanying drawing.

215885

24-c

My improvement relates particularly to [illegible] for transmitting power through endwise reciprocating [illegible] the mechanism. The mechanism is applicable for use as an operating means for the shutters of cameras, and as an operating or releasing means for various kinds of apparatus.

The object of the invention is to provide a transmitting mechanism inflexible form permitting [illegible] without injury to the mechanism, and in a manner to insure the attainment of precise movement.

In the accompanying drawings,

Figs. 1a and 1b together present a longitudinal section of a mechanism embodying my improvement, portions being in elevation;

Fig. 2 is a section on the line, 2---2, of Fig. 1, looking toward the left;

Fig. 3 is a section on the line, 3---3, of Fig. 1, looking toward the left;

Fig. 4 is a section on the line, 4---4, of Fig. 1, looking toward the left;

Fig. 5 is a section on the line, 5---5, of Fig. 1, looking toward the right.

Referring to said drawings, A is a metallic tube or barrel having its left hand end screw-threaded into the contracted portion, B1, of the outer head, B, whereby said barrel and said head are firmly but detachably joined to each other. The opposite end of said barrel is contracted to form a neck, A1. At the junction of said neck with the body of said barrel is a shoulder, A2. A stem, F, extends slidably through the head, B. Within said head, the stem has an annular rib, F1, which limits the movement of said stem toward the left [illegible]

the neck, A1, of the barrel, A. Between said annular rib and the shoulder, A2, the stem, F, is surrounded by an expanding coiled spring, G. Said spring abuts against the shoulder, A2, and against the rib, F1, and tends to move the stem, F, toward the left or away from the neck, A1, so that, when said stem is free from pressure on its outer end in the direction of the barrel, the stem is held outward with the rib, F1, bearing against the inner face of the wall of the head, D.

The neck, A1, is loosely surrounded by the left hand end of a coiled spring wire tube, C. The right hand end of said spring extends into a head, D. Said head has a tubular neck, D1, in which is an annular shoulder, D2, against which said spring abuts. Said spring rests loosely within said head. The head, D, and the Head, D, are joined by a fiber fabric tube, D. At its left hand end, said fabric tube surrounds the barrel, A, and the head, D, has a tubular extension, D3, surrounding said fabric tube. The fabric is secured to the barrel, A, by means of a suitable adhesive. At the right hand end, the fabric tube surrounds the neck, D1, on the head, D, and a band, D1, surrounds the fabric tube and binds the latter to said neck.

The coiled spring wire tube, C, is so wound as to leave spaces between the coils, and said tube is made long enough to cause it to be under compression endwise when the fiber fabric tube is under tension. Thus the fiber fabric tube is normally held under tension and the coiled spring wire tube, C, is normally exerting endwise pressure. And the fiber fabric tube limits the endwise expansion of said wire tube. The length of the fiber fabric tube and the coiled wire tube, C, and the spacing between the coils of the tube are so proportioned as to still leave spaces between the coils of the tube, C, when the latter is held

under restraint by the fiber fabric tube against full endwise expansion. The spaces thus left between the coils of the tube, C, are sufficient to allow approach of adjacent coils toward each other at the inner side of the curve while there is limited or substantially no expansion of the coils at the outer side of the curve when the tube is bent.

On the inner or right hand end of the stem, F, is a neck, F2, at the base of which is an annular shoulder, F3. Said neck is surrounded by one end of a coiled wire tube, J. The opposite or right hand end of said tube extends around a neck, I1, on a slide member, I, which is slidable endwise in the head, H. The engagement between the tube, J, and the necks, F2 and I1, may be frictional, but said necks are preferably screw-threaded to conform approximately to the coils of the tube, J, in order that said tube may be threaded to said necks. The tube, J, is preferably so formed as to cause its coils to normally press firmly against each other, in order that there may be no lost motion when the stem, F, is pressed inward, in the direction of the head, H, the stem, F, pushing the tube, J, and the tube, J, pushing the slide member.

The slide member, I, may be regarded as the final member in the transmission. In the particular form shown in the drawings the outer end of said member has a concave face, I2, adapted to bear against a pivoted member, K, which is to be moved by the outward movement of the slide member, the head, H, being screwed into a relatively stationary wall, L, and thus held in relation to the member, K.

The coils of the tube, C, are wound in one direction while the coils of the tube, J, are preferably wound in the opposite direction.

As above described, the tube, J, is held to the neck,

2,168,805-4

24-f

F2, of the stem, F, and the slide member, I, is held to the tube, J, by means of the neck, I1. After unscrewing the head, B, from the barrel, A, the stem, F, together with the spring tube, J, and the slide member, I, may be drawn out endwise, toward the left, through the barrel, A, the diameter of the tube, J, and the slide member being of less diameter than the interior diameter of the tube, C.

The fabric tube, D, may be detached by removing the band, D1, and softening or dissolving the adhesive by which said fabric is secured to the barrel, A.

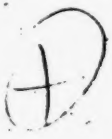
This mechanism comprises two important features. One of these is the closely-wound coiled wire transmission tube, J, connected with the stem, F, and the slide member, I, whereby there may be transmission without lost motion. The other of these features is the forming of the outer coiled wire tube, C, in such manner as to permit bending the tube without material separation of the coils at the outer side of the curve, the spacing between the coils permitting the coils to approach each other on the inner side of the curve while the tube is being bent. The member, I, being free to slide, the adjacent end of the inner wire tube, J, is free to move endwise when the mechanism is being bent. In this manner, the inner tube, although closely-wound, adapts itself to the bending without kinking.

Practice has shown that a mechanism of this construction may be bent an indefinite number of times without kinking or otherwise disabling the coiled wire tubes.

The reach of the slide member, I, may be adjusted by moving the tube, J, on both or either of the necks, F2 and I1. In this manner a very precise adjustment may be made.

The size of the mechanism is to be varied to conform to

the amount of power to be transmitted and to the size of the apparatus with which the transmission mechanism is to be associated. For some purposes the mechanism may be as large or larger than shown by the drawings. For example, in power-driven vehicles the mechanism may be made large and used for power transmission to some point distant from the driver, the stem, F, being used as a pedal.



I claim as my invention,

1. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

2. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

3. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means tending normally holding said stem at its outer limit, a slide member.

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the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

4. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

5. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

6. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definite-

ly holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

7. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

8. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the

transmission of endwise motion from said stem to said slide member, substantially as described.

9. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and (adjustably) joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

10. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and adjustably ~~joined to~~ surrounding said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

11. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem ex-

tending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

12. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

13. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion, said intervening means and said slide member and said stem being together removable, substantially as described.

14. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem toward and to said slide member, said intervening means and said slide member and said stem being together removable, substantially as described.

15. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem toward and to said slide member, said intervening means and said slide member and said stem being together removable, substantially as described.

16. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance

from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, said intervening means and said slide member and said stem being together removable, substantially as described.

17. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

18. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

19. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and a coiled wire tube intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

20. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and a coiled wire tube intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

21. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means surrounding said spring wire tube and joining said heads and definitely holding them at a fixed distance from each other while said

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24-p.

spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

22. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means surrounding said spring wire tube and joining said heads, and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

23. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

24. In a mechanism of the nature described, the com-

bination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and threaded to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

25. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem toward and said intervening tube and said slide member and said stem are together removable, substantially as described.

26. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of

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24-r

said heads, and a coiled wire tube intervening and threaded to said stem and said slide member for the transmission of endwise motion from said stem toward and to said slide member, said intervening tube and said slide member and said stem ~~being~~ are together removable, substantially as described.

215885

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In testimony whereof I have signed my name, ~~in presence of two witnesses~~, this 1st day of February, in the year one Thousand Nine Hundred and Eighteen.

Charles B. Gray
INVENTOR

WITNESS

WITNESS

Oath

State of Tennessee)
) ss.
County of Knox)

Charles Baxter Gray

the above-named petitioner, being sworn, deposes and says that he is a citizen of the United States and resident of

Knoxville, Knox County, Tennessee;

that he verily believes himself to be the original, first and sole inventor of the improvement in

Power Transmitting Mechanism

described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States; that the first portion of his name is as above written.

Charles B. Gray
INVENTOR

Sworn to and subscribed before me this 1st day of February 1918

Roy A. Johnston
Notary Public.

(L. S.)

215885
18

24-t

The Commissioner of Patents, Washington, D. C., and not any official by name.

Application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON February 25, 1918.

PATENT OFFICE. FEB 25 1918 MAILED.

Cyrus Kehr,

Empire Building,

Knoxville, Tennessee.

Please find below a communication from the EXAMINER in charge of the application of

C. B. Gray, for Power Transmitting Mechanism, filed February 7, 1918, Serial Number 215,885.

James T. Newton

Commissioner of Patents.

S-221

This case has been examined.

Claims 1 to 9, 11 and 12, are rejected as not patentable over -

British to Watson, 13,157, June 28, 1905, (64-30-B.M.), (see Figure 2). To attach a slide element to the end of the transmission member instead of attaching the transmission member directly to the device to be operated upon is not patentable in view of the disclosure in -

939,573, Edwards, July 27, 1909, (64-30-B.M.)(see Fig. 2).

Claim 10 is rejected as not patentable over the citations above. The idea of making the transmission of adjustable length is not patentable over threaded connections 10 and 11 shown in -

1,072,439, Duryea, Sept. 9, 1913, (64-30-B.M.)

Claims 13, 14, 15, 16, 35, and 36 are rejected the same as claim 1. Obviously the transmission member in the references is not placed in the mechanism beyond the possibility of removal. If applicant's device is of such construction as to offer particular facilities for removal such feature should be defined in terms of structure and not by the functional statement that it has a certain capacity or manner of operation.

Claims 17 to 32 inclusive are rejected on the British pa-

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24-u

tent to Edwards cited. To construct the transmission element of a coiled wire tube is not patentable in view of -

German to Wermann, 147,572, June 23, 1904, (84-30-B.M.) (1 sheet).

Claims 33 and 34 appear allowable. Attention is directed to the excessive number of claims in this application, many of them of the same scope and substantially duplicates. Such practice is directly in contravention of numerous decisions both by this office and by the courts and serves no purpose other than to impose a needless burden upon this office and thereby delay the proper prosecution of the case. See --

Ex parte Chapman, 130 O. G. 2446.
In re Carpenter, 113, O.G. 503.
Ex parte, Kadow, 154 O. G. 1418.
Ex parte Johnson, 54 O. G. 505.

E.C.W.A.

E. A. Sauer
Exr. Div. 13.

215885

24-v

MAY 28 1918 5727
U. S. PATENT OFFICE

Room No. 322.

AMENDMENT.

Knoxville, Tenn: May 25, 1918

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the application of
Charles B. Gray,
Ser. No. 215,885,
Filed February 7, 1918,
"Power Transmitting Mechanism".

This is in response to the Examiner's letter, dated February 25, 1918.

Page 1, line 7, from the bottom, before "head" insert "outer".

Page 2, line 10, after "hand" insert "or inner".

Same page, line 11, after "into" cancel "a", and insert "an inner".

Same line after "Said" insert "inner".

Claims 1 to 9, 11 and 12, line 2, before "a coiled", insert "a barrel on the outer head,".

Claims ~~1~~ to ~~9~~, ~~11~~ and ~~12~~, line 3, after "heads", insert "and engaging said barrel".

Claim 13, line 9, after "motion" cancel the comma and insert: from the stem toward and to the slide member, the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing

of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,

✓ Claim 13, line 10, cancel "being" and insert "are".

✓ Claim 14, line 10, after "stem" insert "toward and".

✓ Claim 14, line 11, before "said intervening", insert "the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,".

✓ Claim 14, line 12, cancel "being" and insert "are".

✓ Claim 15, line 11, after "stem" insert "toward and".

✓ Claim 15, line 12, before "said intervening" insert "the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,".

✓ Claim 15, last line, cancel "being" and insert "are".

✓ Claim 16, line 10, after "stem" insert "toward and".

✓ Claim 16, line 10, before "said intervening" insert "the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,".

✓ Claim 16, line 11, cancel "being" and insert "are".

Claim 24, line 10, after "stem" insert "toward and".

Same claim, line 11, before "said intervening" insert "the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,".

Claim 25, line 11, cancel "being" and insert "are".

Claim 26, line 10, after "stem" insert "toward and".

Claim 26, line 10, before "said intervening" insert "the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head,".

Claim 30, line 11, cancel "being" and insert "are".

Claims 17, 18, 19, 20, 21 and 22, line 2, before "a coiled" insert "a barrel on the outer head,".

Claims 17 to 22, inclusive, line 3, after "said heads" insert " and engaging said barrel".

Add the following claims:

27. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said

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21-Y

heads and having limited outward movement; a slide member in the other of said heads, and a coiled wire tube intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, one of said joinings being adjustable, substantially as described.

26. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, one of said joinings being by threading, substantially as described.

The references do not show the barrel and the coiled wire tube engaging the barrel, as now made elements in claims 1 to 9, 11 and 12.

Claims 13, 14, 15, 16, 25 and 26 have been amended to specify structure whereby the stem and the slide member and the intervening transmission member are made removable.

Claims 17 to 22, inclusive, have been amended to include the barrel and to specify that the outer spring tube engages, features not present in the references.

The Examiner's letter indicates that applicant has an excessive number of claims, "many of them of the same scope and substantially duplicates"; but it is not stated which claims are regarded as of the same scope or substantially duplicates.

215885-M Very respectfully submitted,

Ogrus Keller Atty.

24-z

H/KL.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON June 15,1918.

Cyrus Kehr.
Empire Bldg.
Knoxville, Tenn.

PATENT OFFICE
JUN 15 1918
MAILED

Please find below a communication from the EXAMINER in charge of the application of
Charles B/Gray. Serial No/215,885. Power Transmitting Mechanism.
Filed Feb. 7,1918.

James T. Newton
Commissioner of Patents.

Response to Amendment dated May 27,1918.

Claims 1 and 4 are allowed.

Claims 2,3 and 5 to 9 are rejected as including no patentable elements distinguishing from claims 1 and 4 allowed. See ex parte Johnson, and ex parte Chapman, cited in last office action. Morever, claims 5,6,7 and 8 are duplicates respectively of claims 1,2,3 and 4. Claim 9 is a duplicate of claim 2 except for the word"adjustably", in line 8 and this feature is not patentable in view of Duryea of record.

Claim 10 stands rejected as noted in last office letter .

Claims 11 and 12 are rejected as not patentably distinct from claims 1 and 4 respectively, except for the word"adjustably" which is not a patentable feature as noted above.

See ex parte Griffith 85 O.G.936
ex parte Whitelaw 219 O.G/1237

Claim 13 is allowed.

Claim 14,15,16,25 and 26 are rejected as not patentably distinct from claim 13 allowed. Merely adding elements old in the art to claim 13, defines no patentable novelty.

215885

24-aa

215,865.--2

Claims 17 to 22 are rejected as not patentably distinct from claims 1 and 4, allowed. The use of the "coiled wire tube" for the " intervening means" defined in claim 1 is not patentable in view of the German patent of record. In other words- applicant merely adds a limitation found in the prior art -- to allowed claims which is not patentable.

Claims 23 and 24 stand allowed.

Claim 27 is rejected as not patentably distinct from claim 23 allowed.

Claim 28 is rejected as not patentably distinct from claim 24 allowed .

Examiner, Division 12.

215885
26

24-bb

Room 32. JUN 18 1918 U.S. PATENT OFFICE

AMENDMENT.

Knoxville, Tenn. June 17, 1918

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the application of
Charles B. Gray,
Ser. No. 215,885,
Filed Feb. 7, 1918,
"Power Transmitting Mechanism".

The Examiner's letter of the 15th inst. has been received.

Cancel claims 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 25 and 26.

Claim 10, line 9, cancel "joined to" and insert "surrounding".

Renumber the remaining claims consecutively.

Attention is directed to the fact that claims 27 and 28 are generic relative to claims 23 and 24, and it is therefore urged that claims 27 and 28 should be allowed.

Very respectfully submitted,

Attorney.

1. 4. 13. 23. 24
2. 4. 3. 6

X. 3. 3 – X 10. 11. 12. 14 – X. 24. 26. 27. 28
3. 7. 8

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27

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Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

H:W

UNITED STATES PATENT OFFICE

WASHINGTON July 18, 1918.

PATENT OFFICE JUL 18 1918 MAILED

Cyrus Kehr,

Empire Building,

Knoxville, Tenn.

Please find below a communication from the EXAMINER in charge of the application of

Charles B. Gray, Serial No. 215,885, filed Feb. 7, 1918, for

Power Transmitting Mechanism.

James T. Newton

Commissioner of Patents.

6-3m

In response to amendment filed June 18, 1918.

Claims 1, 2, 4, 5 and 6 stand allowed.

Claim 3 is allowed.

Claims 7 and 8 stand rejected as noted in last office letter. The only distinction between claims 5 and 7 is in the definition in one case of the coiled wire tube as being adjustably joined to the stem and slide while in the other, the tube is defined as having one joining adjustable, thereby duplicating the adjustable feature at both ends of the tube is not a patentable distinction particularly in view of the disclosure in Duryea of record. The same argument applies to claim 8.

Examiner.

215885

ROOM
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AMENDMENT.

Knoxville, Tenn. Jan. 29, 1919

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the application of
Charles E. Gray,
Ser. No. 215,885,
Filed Feb. 7, 1918,
"Power Transmitting Mechanism."

This is in response to the Examiner's letter, dated July 18, 1918.

Cancel claims 7 and 8.

Very respectfully submitted,

Attorney.

215885

ADDRESS ONLY
THE COMMISSIONER OF PATENTS,
WASHINGTON, D. C.

2—181

Serial No. 215,885.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON Feb. 6, 1919.

Charles B. Bray,

Sir: Your APPLICATION for a patent for an IMPROVEMENT in Power Transmitting Mechanism, filed Feb. 7, 1918, has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

James T. Newton
Commissioner of Patents.

Cyrus Kehr,
Empire Bldg.,
Knoxville, Tenn.

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IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

E. 1075.

$20 REC'T AUG 5 1919 PATENT OFFICE

2—327.

MEMORANDUM
OF
FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 215,885, *191*

INVENTOR:

Charles B. Gray

PATENT TO BE ISSUED TO

Charles B. Gray

NAME OF INVENTION, AS ALLOWED:

Power Transmitting Mechanism

DATE OF PAYMENT:

August 4, 1919

FEE:

$20.00

DATE OF FILING:

February 7, 1918

DATE OF CIRCULAR OF ALLOWANCE:

February 6, 1919

The Commissioner of Patents will please apply the accompanying fee as indicated above.

Cyrus Kehr
Attorney.

SEND PATENT TO

Cyrus Kehr
607 Empire Bldg.,
Knoxville, Tenn.

215885
21

24-gg

564

C. B. GRAY.

POWER TRANSMITTING MECHANISM.

APPLICATION FILED FEB. 7, 1918.

1,314,867.

Patented Sept. 2, 1919.

2 SHEETS SHEET 1.

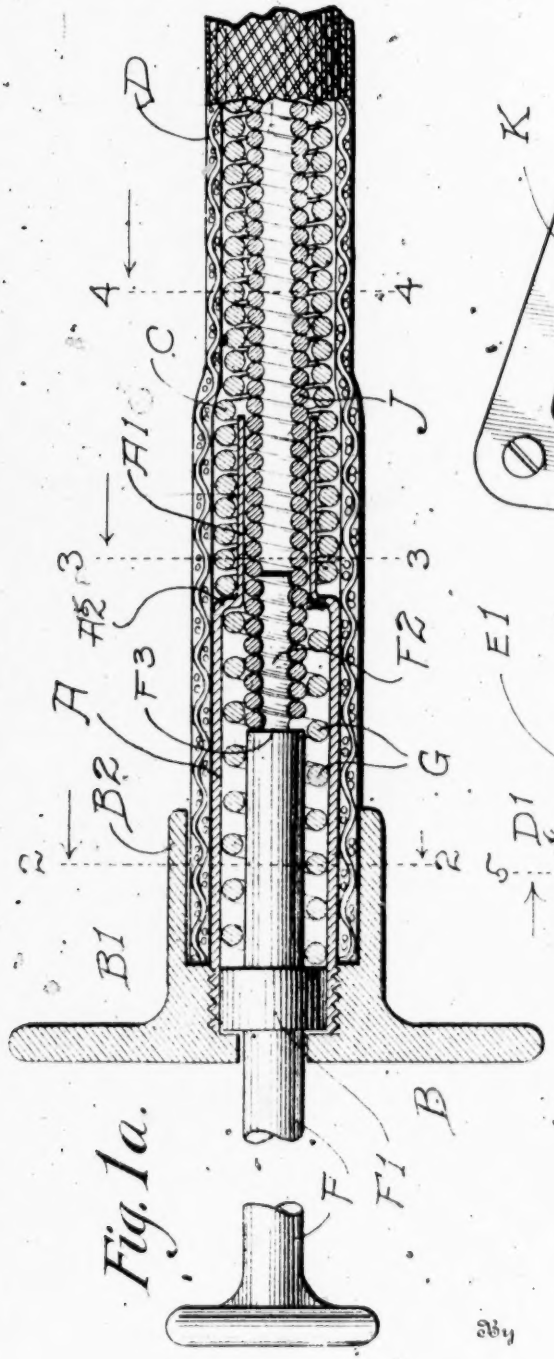


Fig. 1a.

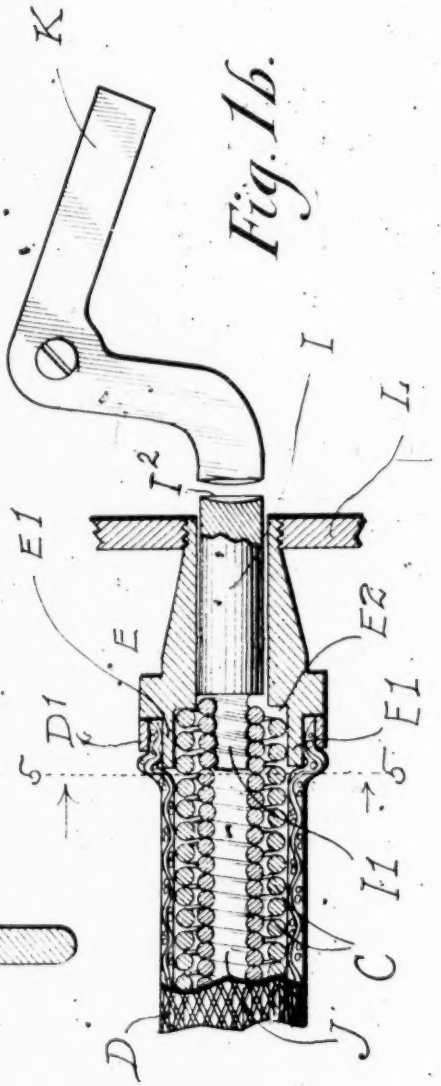


Fig. 1b.

Inventor

Charles B. Gray

By Cyrus Keller

Attorney

C. B. GRAY.
POWER TRANSMITTING MECHANISM.
APPLICATION FILED FEB. 7, 1918.

1,314,867.

Patented Sept. 2, 1919
2 SHEETS—SHEET 2.

Fig. 3.

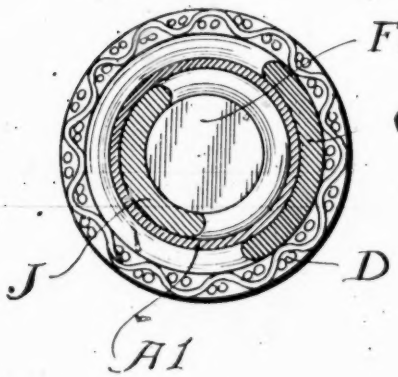


Fig. 4

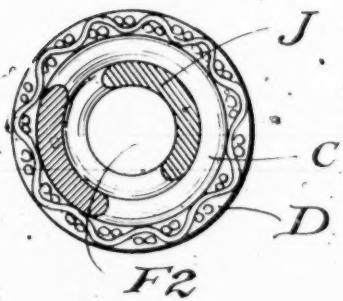


Fig. 5.

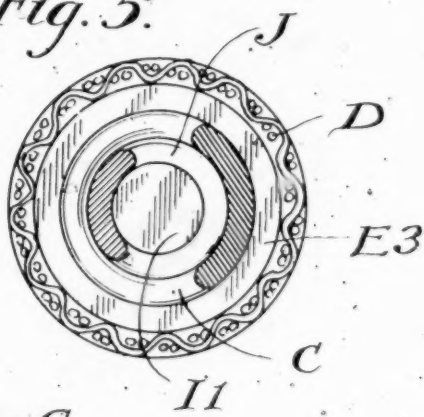
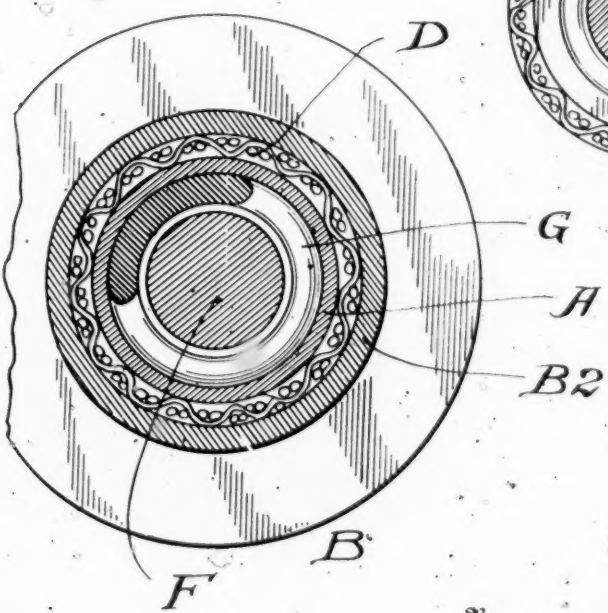


Fig. 2.



Inventor
Charles B. Gray

By Cyrus Keller
Attorney

UNITED STATES PATENT OFFICE.

CHARLES B. GRAY, OF KNOXVILLE, TENNESSEE.

POWER-TRANSMITTING MECHANISM.

1,314,867. Specification of Letters Patent. Patented Sept. 2, 1919.

Application filed February 7, 1918. Serial No. 215,885.

To all whom it may concern:

Be it known that I, CHARLES BAXTER GRAY, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented a new and useful Improvement in Power-Transmitting Mechanism, of which the following is a specification, reference being had to the accompanying drawing.

My improvement relates particularly to mechanism for transmitting power through endwise reciprocation of a member of the mechanism. The mechanism is applicable for use as actuating means for the shutters of cameras, and as an actuating or releasing means for various kinds of apparatus.

The object of the invention is to produce such a transmitting mechanism in flexible form permitting repeated bending without injury to the mechanism, and in a form permitting the attainment of precise movement.

In the accompanying drawings,

Figures 1ª and 1ᵇ together present a longitudinal view of a mechanism embodying my improvement, portions being in section;

Fig. 2 is a section on the line, 2—2, of Fig. 1, looking toward the left;

Fig. 3 is a section on the line, 3—3, of Fig. 1, looking toward the left;

Fig. 4 is a section on the line, 4—4, of Fig. 1, looking toward the left;

Fig. 5 is a section on the line, 5—5, of Fig. 1, looking toward the right.

Referring to said drawings, A is a metallic tube or barrel having its left hand end screw-threaded into the contracted portion, B^1, of the outer head, B, whereby said barrel and said head are firmly but detachably joined to each other. The opposite end of said barrel is contracted to form a neck, A^1. At the junction of said neck with the body of said barrel is a shoulder, A^2. A stem, F, extends slidably through the head, B.

Within said head, the stem has an annular rib, F^1, which limits the movement of said stem toward the left or away from the neck, A^1, of the barrel, A. Between said annular rib and the shoulder, A^2, the stem, F is surrounded by an expanding coiled spring, G. Said spring abuts against the shoulder, A^2, and against the rib, F^1, and tends to move the stem, F, toward the left or away from the neck, A^1, so that, when said stem is free from pressure on its outer end in the direction of the barrel, the stem is held outward with the rib, F^1, bearing against the inner face of the wall of the head, B.

The neck, A^1, is loosely surrounded by the left hand end of a coiled spring wire tube, C. The right hand or inner end of said spring extends into an inner head, E. Said inner head has a tubular neck, E^1, in which is an annular shoulder, E^2, against which said spring abuts. Said spring rests loosely within said head. The head, B, and the head, E, are joined by a fiber fabric tube, D. At its left hand end, said fabric tube surrounds the barrel, A, and the head, B, has a tubular extension, B^2, surrounding said fabric tube. The fabric is secured to the barrel, A, by means of a suitable adhesive. At the right hand end, the fabric tube surrounds the neck, E^1, on the head, E, and a band, D^1, surrounds the fabric tube and binds the latter to said neck.

The coiled spring wire tube, C, is so wound as to leave spaces between the coils, and said tube is made long enough to cause it to be under compression endwise when the fiber fabric tube is under tension. Thus the fiber fabric tube is normally held under tension and the coiled spring wire tube, C, is normally exerting endwise pressure. And the fiber fabric tube limits the endwise expansion of said wire tube. The length of the fiber fabric tube and the coiled wire tube, C, and the spacing between the coils of the tube are so proportioned as to still leave spaces between the coils of the tube, C, when the latter is held under restraint by the fiber fabric tube against full endwise expansion. The spaces thus left between the coils of the tube, C, are sufficient to allow approach of adjacent coils toward each other at the inner side of the curve while there is limited or substantially no expansion of the coils at the outer side of the curve when the tube is bent.

On the inner or right hand end of the stem, F, is a neck, F^2, at the base of which is an annular shoulder, F^3. Said neck is surrounded by one end of a coiled wire tube, J. The opposite or right hand end of said tube extends around a neck, I^1, on a slide member, I, which is slidable endwise in the

head, E. The engagement between the tube, J, and the necks, F^2 and I^1, may be frictional; but said necks are preferably screw-threaded to conform approximately to the coils of the tube, J, in order that said tube may be threaded to said necks. The tube, J, is preferably so formed as to cause its coils to normally press firmly against each other, in order that there may be no lost motion when the stem, F, is pressed inward, in the direction of the head, E, the stem, F, pushing the tube, J, and the tube, J, pushing the slide member.

The slide member, I, may be regarded as the final member in the transmission. In the particular form shown in the drawings the outer end of said member has a concave face, I^2, adapted to bear against a pivoted member, K, which is to be moved by the outward movement of the slide member, the head, E, being screwed into a relatively stationary wall, L, and thus held in relation to the member, K.

The coils of the tube, C, are wound in one direction while the coils of the tube, J, are preferably wound in the opposite direction.

As above described, the tube, J, is held to the neck, F^2, of the stem, F, and the slide member, I, is held to the tube, J, by means of the neck, I^1. After unscrewing the head, B, from the barrel, A, the stem, F, together with the spring tube, J, and the slide member, I, may be drawn out endwise, toward the left, through the barrel, A, the diameter of the tube, J, and the slide member being of less diameter than the interior diameter of the tube, C.

The fabric tube, D, may be detached by removing the band, D^1, and softening or dissolving the adhesive by which said fabric is secured to the barrel, A.

This mechanism comprises two important features. One of these is the closely-wound coiled wire transmission tube, J, connected with the stem, F, and the slide member, I, whereby there may be transmission without lost motion. The other of these features is the forming of the outer coiled wire tube, C, in such manner as to permit bending the tube without material separation of the coils at the outer side of the curve, the spacing between the coils permitting the coils to approach each other on the inner side of the curve while the tube is being bent. The member, I, being free to slide, the adjacent end of the inner wire tube, J, is free to move endwise when the mechanism is being bent. In this manner, the inner tube, although closely-wound, adapts itself to the bending without kinking.

Practice has shown that a mechanism of this construction may be bent an indefinite number of times without kinking or otherwise disabling the coiled wire tubes.

The reach of the slide member, I, may be adjusted by moving the tube, J, on both or either of the necks, F^2 and I^1. In this manner a very precise adjustment may be made.

The size of the mechanism is to be varied to conform to the amount of power to be transmitted and to the size of the apparatus with which the transmission mechanism is to be associated. For some purposes the mechanism may be as large or larger than shown by the drawings. For example, in power-driven vehicles, the mechanism may be made large and used for power transmission to some point distant from the driver, the stem, F, being used as a pedal.

I claim as my invention,

1. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head, a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

2. In a mechanism of the nature described, the combination of two heads, a barrel on the outer head, a coiled spring wire tube having spaced coils and being located between said heads and engaging said barrel, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

3. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, yielding means for normally holding said stem at its outer limit, a slide member in the other of said heads, and means intervening and adjustably surrounding said stem and said slide

member for the transmission of endwise motion from said stem to said slide member, substantially as described.

4. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and means intervening and joined to said stem and said slide member for the transmission of endwise motion from the stem toward and to the slide member, the inner head having an axial opening extending through said head and of sufficient diameter to allow the movement of the slide member through the head toward the outer head, and the inner diameter of the coiled spring wire tube being sufficient to allow the free passing of said slide member and said intervening means toward the outer head, whereby, after the detachment of the outer head, said intervening means and said slide member and said stem are together removable, substantially as described.

5. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and adjustably joined to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

6. In a mechanism of the nature described, the combination of two heads, a coiled spring wire tube having spaced coils and being located between said heads, flexible means joining said heads and definitely holding them at a fixed distance from each other while said spring wire tube is partially compressed endwise, a stem extending slidably through one of said heads and having limited outward movement, a slide member in the other of said heads, and a coiled wire tube intervening and threaded to said stem and said slide member for the transmission of endwise motion from said stem to said slide member, substantially as described.

In testimony whereof I have signed my name this 1st day of February, in the year one thousand nine hundred and eighteen.

CHARLES B. GRAY.

Shafting
Flexible

1918

CONTENTS:

1. Application	1	26.	
2. Reg.	FEB 22 1918	27.	
3. Amendment C	May 27, 1918.	28.	
4. Reg.		29.	
5. Amendment B	June 18, 1918.	30.	
6. Reg.	JUL 1 1918	31.	
7. Amendment C	Jan 31, 1919	32.	
8.		33.	
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25.		50.	

215885 - 32

Serial No. 214,885. Div. 12.

2 Sheets Sheet 1

C. B. GRAY.

POWER TRANSMITTING MECHANISM.

APPLICATION FILED FEB. 7, 1918.

1,314,867.

Patented Sept. 2, 1919.

2 SHEETS—SHEET 1.

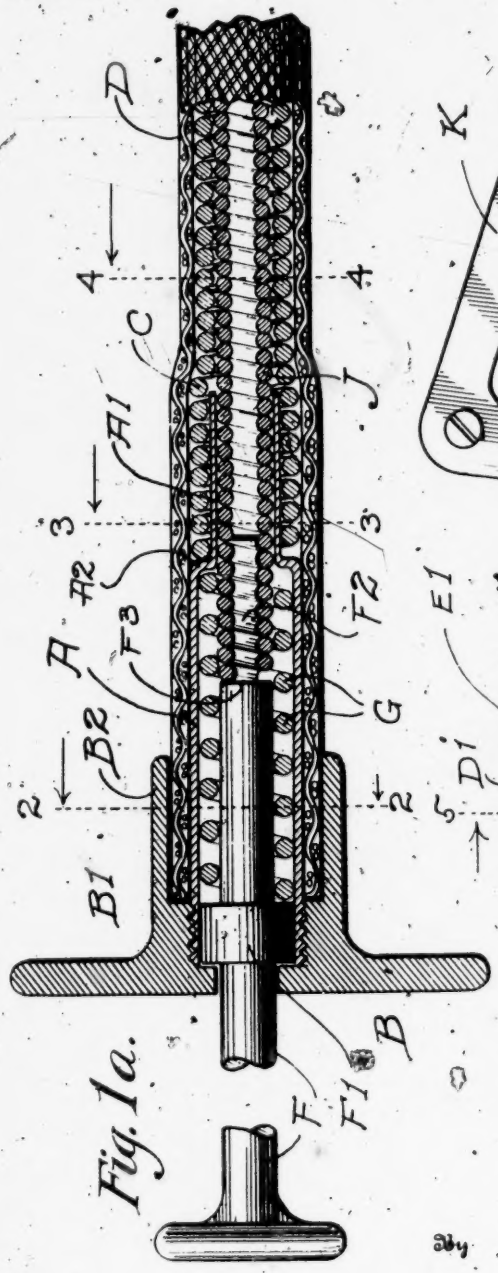


Fig. 1a.

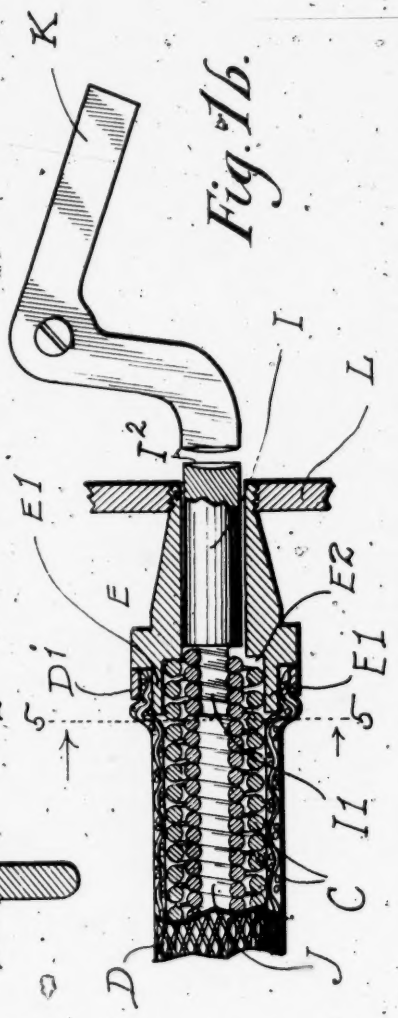


Fig. 1b.

Inventor

Charles B. Gray

By Cyrus Keller

Attorney

...VAL BOXES, PULLEYS, AND SHAFTING.
Shafting.
Flexible.
F.16 73-23-32

Serial No. 215 885 Div. 12
2 Sheets Sheet 2

C. B. GRAY.

POWER TRANSMITTING MECHANISM.

APPLICATION FILED FEB. 7, 1918.

1,314,867.

Patented Sept. 2, 1919.

2 SHEETS—SHEET 2.

Fig. 3.

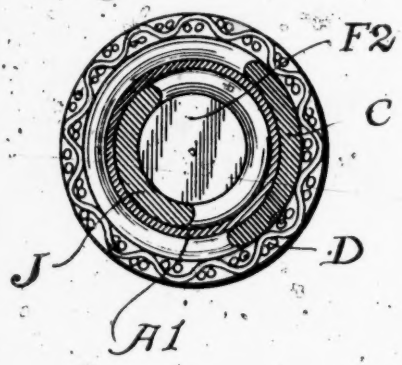


Fig. 4

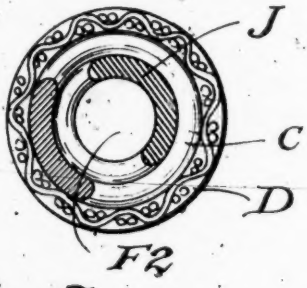


Fig. 5.

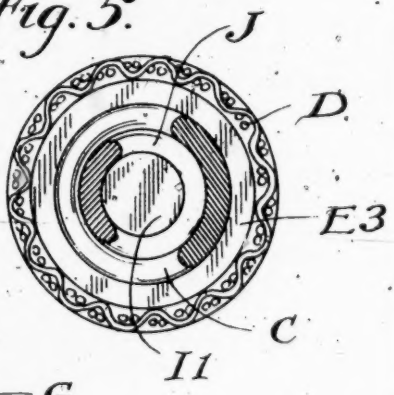
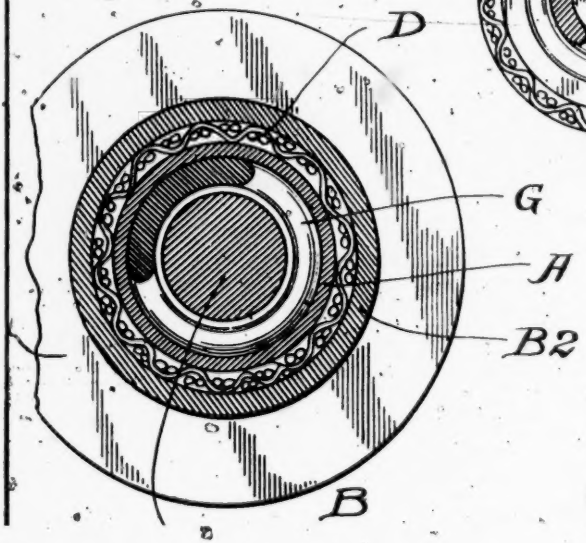


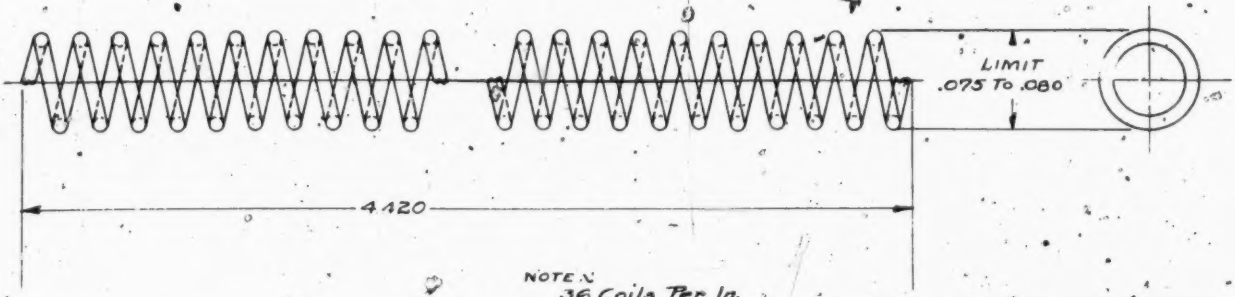
Fig. 2.



Inventor

Charles B. Gray

USED ON
#2-7" CABLE RELEASE



NOTE: 36 Coils Per In.

SPRING CASING

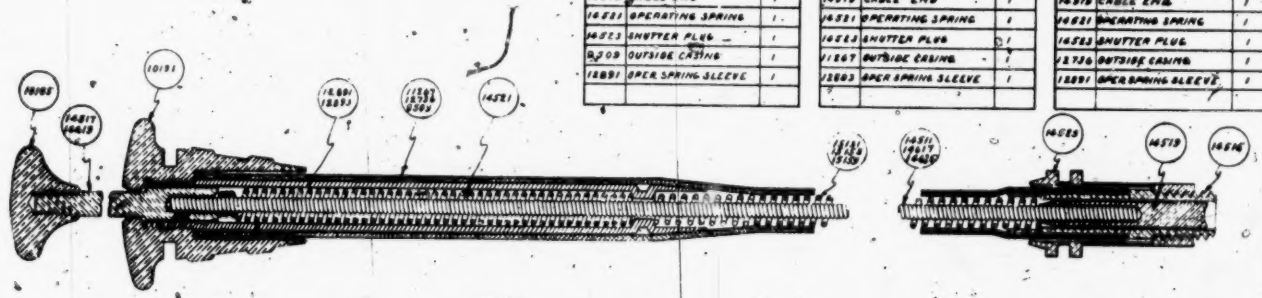
CHANGE NO.	CAMERA WORKS-E. K. CO.		
	CHANGES	DATE	BY
0	Mat. Was #30 (011) BR. W.	10-22-20	
	SCALE DES'GN AP'V'D BY		
	DRAWN BY S.E. DATE 5-8-18		
	CHECKED BY J.E.S. AP'V'D BY		
	MATERIAL #28 (.014) Brass Wire		
	PART NO. DRAWING 15131		

Defendants' Exhibit 3

USED ON 2-7 20-7 CABLE RELEASE		
PART NO.	NAME.	NO IN GROUP
16561	CABLE	1
10185	OPER. PLUNGER CAP	1
16517	OPERATING PLUNGER	1
10191	OPER. SPRG. SLEEVE CAP	1
15131	SPRING CASING	1
16515	SHUTTER PLUG SLEEVE	1
16679	CABLE END	1
16521	OPERATING SPRING	1
16523	SHUTTER PLUG	1
12709	OUTSIDE CASING	1
12891	OPER. SPRING SLEEVE	1

USED ON 13-J CABLE RELEASE		
PART NO.	NAME.	NO IN GROUP
16017	CABLE	1
10185	OPER. PLUNGER CAP	1
16519	OPERATING PLUNGER	1
10191	OPER. SPRG. SLEEVE CAP	1
15133	SPRING CASING	1
16516	SHUTTER PLUG SLEEVE	1
16518	CABLE END	1
16521	OPERATING SPRING	1
16523	SHUTTER PLUG	1
12767	OUTSIDE CASING	1
12803	OPER SPRING SLEEVE	1

USED ON 16-9 CABLE RELEASE		
PART NO.	NAME	NO IN GROUP
14026	CABLE	1
10186	OPER. PLUNGER CAP	1
16517	OPERATING PLUNGER	1
10191	OPER SPRG. SLEEVE CAP	1
10159	SPRING CASING	1
16515	SHUTTER PLUG SLEEVE	1
16519	CABLE END	1
16521	OPERATING SPRING	1
16523	SHUTTER PLUG	1
12736	OUTSIDE CASING	1
12891	OPER SPRING SLEEVE	1



Defendants' Exhibit 4

No 20-7 CABLE RELEASE Construction No 15134
No 2-7 CABLE RELEASE Construction No 15132
No 13-J CABLE RELEASE Construction No 15134
No 16-9 CABLE RELEASE Construction No 15133

CHANGE NO	CAMERA WORKS-E. K. CO CHANGES	DATE	BY
4-7	NO 20-7 CABLE RELEASE CONSTRUCTION CHANGED	9-18-18	JES

SCALE — DRAWN BY DMH DATE 8-16-18
CHECKED BY J.E.S. APP'D BY
MATERIAL
PART NO / DRAWING 15132

26

14 MAY 14 1918 APR 18

MAY 21 1918 EASTMAN KODAK COMPANY MAY 4 1918

CAMERA WORKS

ROCHESTER, N. Y.

Page 1

List of Parts to Make One Complete NO. 3-7 "CABLE RELEASE — 1 BB fa. 1 Bs, 1 Bs Auto Ld. 37PR.

DATE FOR USE WITH 2 BB fa. 3 Bs 7PR, 2 Bs + 3 Bs 7 Bus.

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
14521	OPERATING SPRING MUSIC WIRE	NO. 0 .0093 F & G	Gauge	1
10185	PLUNGER CAP BRASS ROD	9/32"		1
10191	OPERATING SPRING SLEEVE CAP BRASS ROD	7/16"		1
14515	SHUTTER PLUG SLEEVE BRASS ROD	1/8		1
14523	SHUTTER PLUG BRASS ROD	7/32"		1
14519	CABLE END BRASS Rod	.666		1
14517	OPERATING PLUNGER BRASS ROD	3/32"		1
12891	OPERATING SPRING SLEEVE BRASS TURF	.125 OUTSIDE DIA. .085 INSIDE DIA		1
15131	SPRING CASING BRASS WIR	.011	Purchased	1
14511	CABLE Piano Wire	.0087"		1
9801	OUTSIDE CASING LINEN SLEEVE		Purchased	1

D9

Defendants' Exhibit 9

EASTMAN KODAK COMPANY

CAMERA WORKS

ROCHESTER, N. Y.

Page NO. 2

List of Parts to Make One Complete NO.2-7" CABLE RELEASE 1 B.B. FOR 1A JR., 1A AUTO KOD

DATE 5/27/18 3 F.P.K., 2 B.B. FOR 3A F.P.K., 2C & 3A FOLD. BRO. ASSEMBLIES

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
14393	CABLE WITH PLUNGER Leaf 9 of 10			1
	CABLE		14511	1
	OPERATING PLUNGER		14517	1
14394	CABLE RELEASE COMPLETE		15131	1
	SPRING CASING		~~9507~~	
	OUTSIDE CASING		9509	1
	OPERATING PLUNGER CAP		10185	1
	OPERATING SPRING SLEEVE CAP		10191	1
	OPERATING SPRING SLEEVE		12891	1
	CABLE WITH PLUNGER		14393	1
	SHUTTER PLUG SEEEVE		14515	1
	CABLE END		14519	1
	OPERATING SPRING		14521	1
	SHUTTER PLUG		14523	1

Defendants' Exhibit 10

APR 12 1920

F[illegible]MAN KODAK COM[illegible] MAY 28 1918

CAMERA WORKS

ROCHESTER, N. Y.

Page _____

List of Parts to Make One Complete NO.2-7 CABLE RELEASE - 1 B.B. FOR 1A R. 1A AUTO KOD

DATE 5/16/18 3 F.P.K. - 2 B.B. FOR 3A F.P.K., 20 & 3A FOLD. BROWNIE.

PART No.	NAME AND MATERIAL	SIZE		FINISHED
[redacted]	OUTSIDE CASING			
9509	LINEN SLEEVING		PURCHASED	
10185	PLUNGER CAP			
	BRASS ROD	9/32"		
10191	OPERATING SPRING SLEEVE CAP			
	BRASS ROD	7/16"		
12891	OPERATING SPRING SLEEVE			
	BRASS TUBE	.125 OUTSIDE	A .095 INSIDE Ø	
14511	CABLE			
	PIANO WIRE NO. 00	.0087		
[redacted]	Shutter Plug Screw			
14515	BRASS ROD	1/8"		
14517	OPERATING PLUNGER			
	BRASS ROD	3/32"		
14515	CABLE END			
	BRASS ROD	.0		
14521	OPERATING SPRING			
	MUSIC WIRE	[illegible]		
14523	SHUTTER PLUG			
	BRASS ROD	[illegible]		
[illegible]	RING CASING			
	BRASS WIRE NO.30	.011	Purchased	

Defendants' Exhibit 10 (continued)

30

5/24/18

E ..MAN KODAK COMPANY MAY 28 1918

CAMERA WORKS

ROCHESTER, N. Y.

Page 2

List of Parts to Make One Complete NO. 2-7" CABLE RELEASE-1 B B FOR 1A S ..A AUTO. KOD

DATE 5/16/18 3 F.P.K. 2 B B FOR 3A F P K. 20 & 3A FOLD BRO. ASSEMBLIES

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
14393	CABLE WITH PLUNGER			1
	CABLE		14511	1
	OPERATING PLUNGER		14517	1
~~15132~~ 14394	CABLE RELEASE COMPLETE			1
	OUTSIDE CASING		9509 [redacted]	1
	OPERATING PLUNGER CAP		10185	1
	OPERATING SPRING SLEEVE CAP		10191	1
	OPERATING SPRING SLEEVE		12891	1
	CABLE WITH PLUNGER		14393	1
	Shutter Plug Sleeve [redacted]		15175 [redacted]	1
	CABLE END		14519	1
	OPERATING SPRING		14521	1
	SHUTTER PLUG		14523	1
	SPRING CASING	9507	15131	1

Defendants' Exhibit 10 (continued)

MAY 14 1918

APR 30 1918

MAY 21 1918

EASTMAN KODAK COMPANY

CAMERA WORKS

ROCHESTER, N. Y.

MAY 1918

Page 2

List of Parts to Make One Complete NO. 2-7 " CABLE RELEASE

DATE CABLE WITH see sheet bal ASSEMBLIES

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
14393	CABLE WITH PLUNGER			
	OPERATING PLUNGER		14517	
	CABLE		14511	
15132	CABLE RELEASE COMPLETE			
	OPERATING SPRING		14521	
	CABLE END		14519	
	OPERATING SPRING SLEEVE		12591	
	SHUTTER PLUG SLEEVE		14515	
	SHUTTER PLUG		14523	
	SPRING CASING		15131	
	CABLE WITH PLUNGER		14393	
	OUTSIDE CASING		9509	
	OPERATING PLUNGER CAP		10185	
	OPERATING SPRING SLEEVE CAP		10191	

OK

Defendants' Exhibit 10 (continued)

EASTMAN KODAK COMPANY

CAMERA WORKS

ROCHESTER, N. Y.

Page 1 to 49

List of Parts to Make One Complete NO.2-7" CABLE RELEASE- 1 B.B. FOR 1A JR. 1A AUTO. KOD

DATE 5/16/18 3 F.P.K. - 2 B.B. FOR 3A F.P.K. 2C & 3A FOLD. BRO.

PART No.	NAME AND MATERIAL	SIZE		REQUIRED
9509	OUTSIDE CASING			1
	LINEN SLEEVING		PURCHASED	
10185	PLUNGER CAP			1
	BRASS ROD	9/32"		
10191	OPERATING SPRING SLEEVE CAP			1
	BRASS ROD	7/16"		
12891	OPERATING SPRING SLEEVE			1
	BRASS TUBE	.125 OUTSIDE DIA. .085 INSIDE DIA.		
14511	CABLE			1
	PIANO WIRE NO. 00	.0087		
14515	SHUTTER PLUG SLEEVE			1
	BRASS ROD	1/8"		
14517	OPERATING PLUNGER			1
	BRASS ROD	3/32"		
14519	CABLE END			1
	BRASS ROD	.066		
14521	OPERATING SPRING			1
	MUSIC WIRE	NO.0 .0093 F & G. GAUGE		
14523	SHUTTER PLUG			1
	BRASS ROD	7/32"		
15131	SPRING CASING			1
	BRASS WIRE NO.30	.011	PURCHASED	

Defendants' Exhibit 10 (continued)

FORM 148

EASTMAN KODAK COMPANY

CAMERA WORKS

ROCHESTER, N. Y.

List of Parts to Make One Complete NO.2-7" CABLE RELEASE-1 B.B. FOR 1A JR. 1A AUTO. KOD. 3 F.P.K. ÷ 2 B.B. FOR 3A F.P.K. 2C & 3A FOLD. BRO.

DATE 5/16/18

PART NO.	NAME AND MATERIAL	SIZE	ASSEMBLIES	REQUIRED
14393	CABLE WITH PLUNGER			1
	CABLE		14511	1
	OPERATING PLUNGER		14517	1
15132	CABLE RELEASE COMPLETE			1
	OUTSIDE CASING		9509	1
	OPERATING PLUNGER CAP		10185	1
	OPERATING SPRING SLEEVE CAP		10191	1
	OPERATING SPRING SLEEVE		12891	1
	CABLE WITH PLUNGER		14393	1
	SHUTTER PLUG SLEEVE		14515	1
	CABLE END		14519	1
	OPERATING SPRING		14521	1
	SHUTTER PLUG		14523	1
	SPRING CASING		15131	1

Defendants' Exhibit 10 (continued)

Def Ex 11

Patent Dept.
5-95-13
File— Cable release

EASTMAN KODAK COMPANY

ROCHESTER, N.Y.

ADDRESS
CAMERA WORKS
343 STATE STREET

April 12, 1916.

EASTMAN KODAK CO.

APR 12 1916

PATENT DEPT.

Mr. C. L. Jenks,
Main Office.

Dear Sir:

Some time ago in discussing with you the cable release situation, I explained to you the advantage of having an open flexible spring instead of a close wound one. I am sending you four cable releases, two long and two short. One of each is made with an open spring. Nobody will have any difficulty in determining which is which. I am also sending you sample of each of the springs.

I wish you would send these to J. T. Clarke and advise him that we are having a good deal of breakage and defective cable releases on account of the closely wound spring. Wish you would get his opinion as to whether we can safely manufacture them this way and send them to Europe. At the same time, wish you would investigate whether we can make them in this country, and would like your advice on this just as soon as possible.

Very truly yours,

J. A. McJenkins

JAR EW

Defendants' Exhibit 11 ;

Patent Dept.
5-9553
File—Cable release

EASTMAN KODAK COMPANY

ROCHESTER, N.Y.

ADDRESS
CAMERA WORKS
333 STATE STREET

Dec. 24, 1915.

Left 6412

EASTMAN KODAK CO.
DEC 27 1915
PATENT DEPT.

Mr. C. L. Jenks,
Main Office.

Dear Sir:

I am sending you herewith cable release in which the push cable is made of wound spiral coil, same as the casing. This is much more flexible than the cable we have in use. The suggestion came from one of our employes, Ed. Daken on August 13, 1915. We made up a thousand of these cables and they work satisfactorily.

I wish you would look this up and see if this feature is patentable or whether there is anything to prevent our using it.

You might also, as soon as possible, advise me on the chain proposition for the same purpose which I submitted to you some time ago.

Very truly yours,

J. A. Robertson

ANSWERED BY JENKS

JAR EW

Defendants' Exhibit 12

D 14 al

EASTMAN KODAK COMPANY

ROCHESTER, N.Y. December Twelfth,
Nineteen Seventeen

Defendants' Exhibit 14

Mr. G. A. Rigge,
Camera Works.

For
G.A.R

Dear Sir:-

This is to confirm our conversation of yesterday concerning the proposed new metallic cable release. It was suggested that instead of having the outer coil or sheath wound closely for its entire length that a portion at or near each end be coiled more loosely with the convolutions spaced one from another. This would give the advantage of the separated convolutions at the points where the greatest wear comes and where the greatest need for flexibility exists.

The question of infringement remains the same in this country as it did at the time of the reports of Messrs. Church & Rich on Mar. 9, 1914 and July 14, 1916 when a tightly coiled sheath and a loosely coiled sheath, respectively, were discussed, and in each case it was held these could be made without infringement of the nearest U. S. patent No. 828,815. As long as this terminal spring in the present suggested structure is used purely as a sheath, this patent would not be infringed, as you stated this would not be used as the actuating spring for the button. If such a use were contemplated, this patent undoubtedly would be infringed, but we understand that this is not at all contemplated.

As to the infringement of British patent No. 13,157 of 1905, we are in considerable doubt. It will be recalled that the sheath closely wound throughout its entire length did not infringe any british patent, but that the sheath with separated convolutions

throughout its entire length was considered to infringe this british patent. We would not care to state, with any degree of confidence, whether or not the new suggested sheath would infringe this British patent in which the claim states that "the outer member consisting of a coiled wire is formed wholly or mainly with said coils other than touching one another on the abutting faces thereof." In the suggested sheath the greater proportion of the length is closely wound, so in this sense it is not made "mainly" with the separated convolutions. However, it is made with the separated convolutions at the places of the greatest importance, and we are unable to state how this claim would be interpreted. This question will be submitted to Mr. J. Thacher Clarke. This particular arrangement is novel in this country, but the results obtained are so similar to that of the British patent that it is of doubtful patentability. However, if it is to be used commercially, it undoubtedly would be the part of wisdom to apply for a patent.

-- SUMMARY --

The proposed sheath does not infringe any U. S. patents. The situation as regards the British patent is doubtful and will be referred to Mr. J. Thacher Clarke. If it is to be made commercially, a patent application should be filed.

Yours truly,

R. L. Stuckfort

Patent Attorney.

For File
G.A.R

RLP-HD

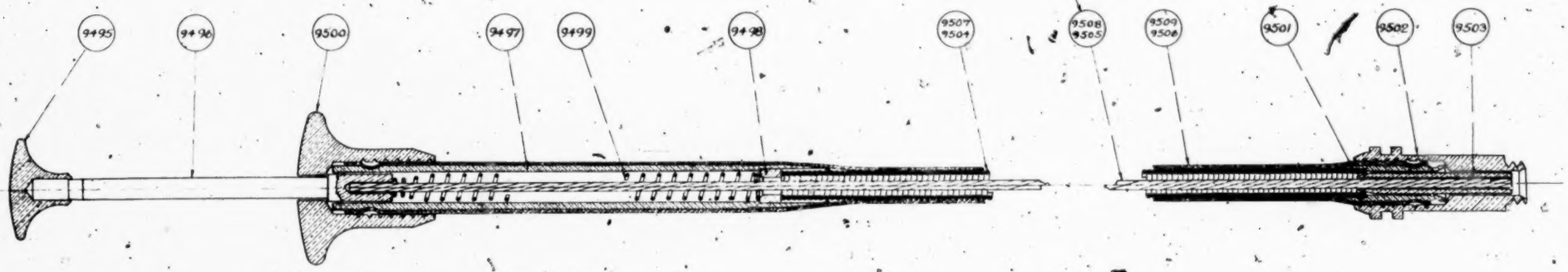
Copy to Mr. Robertson.

Defendants' Exhibit 14 (continued)

USED ON		
Part No.	NAME	No. in Set
9495	Operating Plunger Cap	1
9496	Operating Plunger	1
9497	Operating Spg. Sleeve	1
9498	Operating Spg. Seat	1
9499	Operating Spring	1
9500	Op. Spg. Sleeve Cap	1
9501	Shutter Plug Sleeve	1
9502	Shutter Plug	1
9503	Cable End	1
9507	Spring Casing (6")	1
9508	Cable	1
9509	Outside Casing	1
9510	7" Antinous Release Complete	

Not Used on 12" in place of 9507-8-9		
9504	Spring Casing (12")	1
9505	Cable	1
9506	Outside Casing	1
9511	12" Antinous Release Complete	

Length of Part "9505 = 11.07
" of " "9508 = 6.07



7" Antinous Release, Const. No. 9510.
12" Antinous. Release, Const. No. 9511.

CAMERA WORKS-E. K. CO.		
CHANGES	DATE	BY
Redrawn	10-16-13	
LENGTH OF PART "9505 CHANGED FROM 6.97 TO 6.07	12-19-13	
7" ANTINOUS RELEASE CHANGED TO 7" ANTINOUS RELEASE	12-19-13	
SCALE 5 Times Size		
DRAWN BY H. S	DATE 10-16-13	
CHECKED BY	APV'D BY	
MATERIAL		
PART NO.	9511	
DRAWING		

Defendants' Exhibit 16

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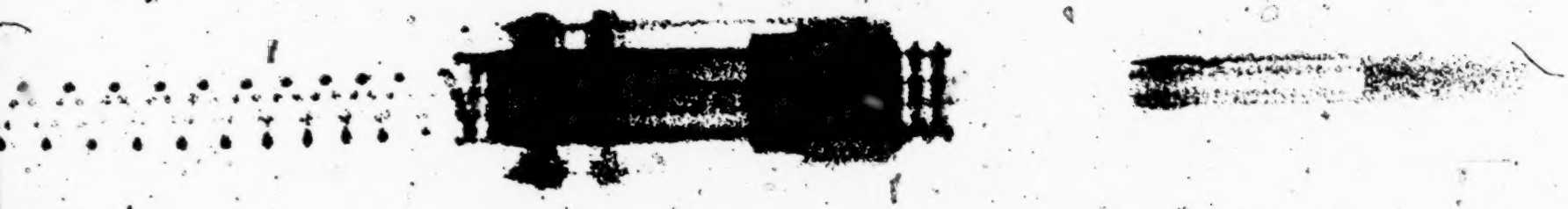
E. K. Co. No 16
Release - Tip only.

D. Ex. 17



Defendants' Exhibit 17

Defendants exhibit No. 18

United States Patent to

A. H. Edwards

No. 828,815 - granted August 14, 1906

40

No. 828,615. PATENTED AUG. 14, 1906.

A. H. EDWARDS.

MECHANISM FOR TRANSMITTING POWER IN VARYING DIRECTIONS.

APPLICATION FILED OCT. 20, 1905.

2 SHEETS—SHEET 1.

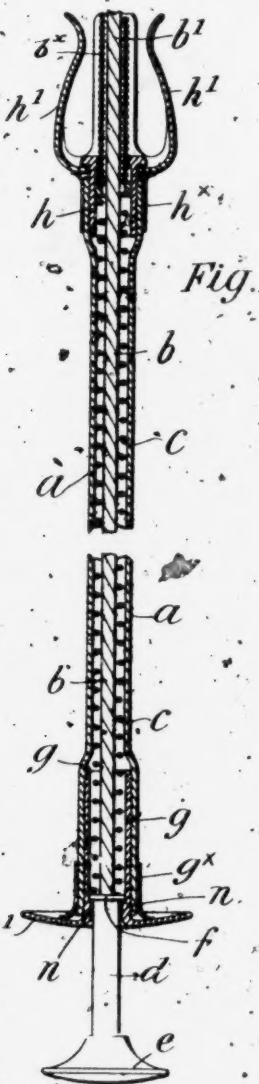


Fig. 1.

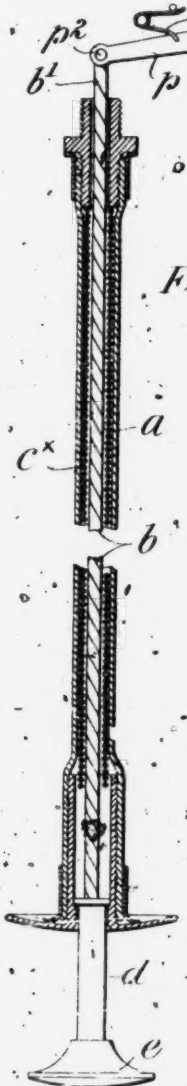


Fig. 4.

Witnesses.
W. Max Durall.
Geo. H. Bryce.

Inventor.
A. H. Edwards.
By Wilkinson & Fisher
Attorneys

HOA

41

No. 828,815. PATENTED AUG. 14, 1906.

A. H. EDWARDS.

MECHANISM FOR TRANSMITTING POWER IN VARYING DIRECTIONS.

APPLICATION FILED OCT. 20, 1905.

2 SHEETS—SHEET 2

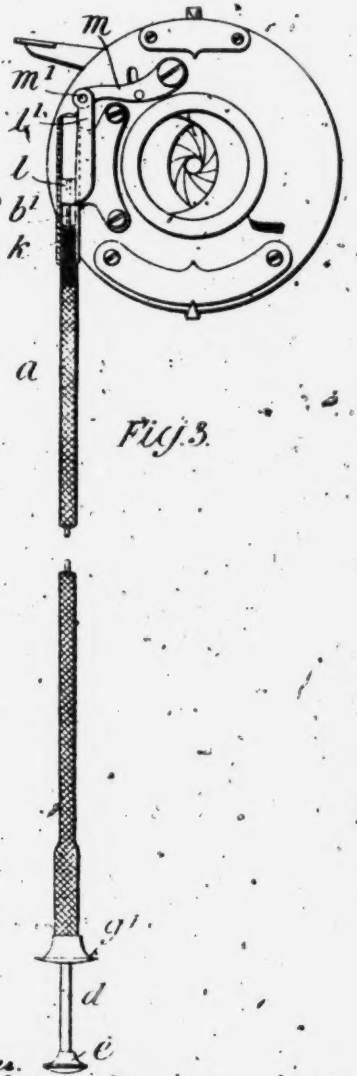


Fig. 3.

Fig. 2.

Witnesses.
W. Max. Durall
Geo. F. Bryce

Inventor
A. H. Edwards
By Wilkinson & Fisher
Attorneys

UNITED STATES PATENT OFFICE.

ARTHUR HENRY EDWARDS, OF STOKE NEWINGTON, LONDON, ENGLAND.

MECHANISM FOR TRANSMITTING POWER IN VARYING DIRECTIONS.

No. 828,815. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed October 20, 1905. Serial No. 283,696.

To all whom it may concern:

Be it known that I, ARTHUR HENRY EDWARDS, engineer, a subject of the King of Great Britain, residing at 96 Lordship road, Stoke Newington, London, England, have invented certain new and useful Improvements in Mechanism for Transmitting Power in Varying Directions, of which the following is a specification.

The object of this invention, primarily, is an improved power-transmission apparatus or mechanism for transmitting power in varying directions, especially suitable for photographic releases (i. *e.*, mechanism for releasing or operating photographic shutters) or for any other purposes to which same may be applicable where great flexibility of such mechanism is required.

Mechanism for the transmission of power in varying directions according to the present invention comprises a flexible outer member which is compressible both lengthwise and crosswise, but is inextensible beyond its normal length, an inner member which is incompressible lengthwise and is adapted to slide within said outer member, means attached to said inner and outer members, respectively, at one end whereby said inner member may be pushed inward to actuate the part to be operated, means at the other end of said inner and outer members to attach the former to the part to be operated by such push when the inner member is pushed inward, as aforesaid, and a spring arranged and adapted to normally keep the outer member stretched to the limit of its extensibility and also adapted to normally keep the inner member pressed outwardly, so as to be ready to be operated, all as hereinafter more fully explained, and finally pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a longitudinal sectional view, taken through flexible transmission mechanism in accordance with the present invention, arranged as a "release" for photographic shutters. Fig. 2 shows a photographic shutter of a well-known type as ordinarily fitted with pneumatic cylinder and piston for a pneumatic release and showing the present invention applied to such shutter in place of said pneumatic release. Fig. 3 shows a similar type of shutter, but instead of the pneumatic cylinder, suitable means are shown for attaching the flexible release according to the present invention. Fig. 4 shows a modification of the arrangement shown in Fig. 1.

Referring now to Figs. 1 to 3, *a* is the outermost member, which may be formed of any suitable fibrous textile fabric and advantageously is formed of braided cotton and is so constructed that although such braided outermost member *a* is compressible both lengthwise and crosswise, nevertheless it is inextensible beyond the normal length of such outermost cover.

b is the flexible innermost member and is advantageously composed of a strand of thin flexible wires in such wise as to be incompressible under the strains (pressure) to which same is normally liable.

c is an open coiled spring, which in the construction shown in Fig. 1 surrounds the innermost member *b* and forms the intermediate member between said innermost member *b* and the outermost member *a*.

The innermost member *b* is attached at one end to the shank *d* of the push-button *e*, provided with a collar or enlargement *f*, and at the other end *b'* said innermost member *b* is attached to or is otherwise arranged to actuate the part or thing to be operated, said innermost member being adapted to slide freely through and with respect to the intermediate member *c* and the outermost member *a*.

The outermost member *a* at one end is attached to the sleeve *g* by passing the end of this flexible outermost member *a* over said sleeve *g* down to the enlargement or flange *g'* thereon and is there secured by the collar $g^{\times}$, which is slid over said member *a* and sleeve *g* and clamped or clipped in position close adjacent the flange *g'*.

At the other end this outermost member *a* is attached to some fixed part of the frame or support carrying the thing or part to be operated. For example, as shown in Fig. 1, this outermost member *a* is clamped by the collar $h^{\times}$ to the sleeve *h*, on the outer end of which are carried spring-arms or prongs *h'*, which latter are adapted to be sprung over the nipple *i* of the ordinary pneumatic release *j*, such as illustrated in Fig. 2, or instead of attaching this end of the outermost member, as shown in Figs. 1 and 2, same may simply be passed up inside a tube or sleeve *k*, as shown in Fig. 3, and the said tube or sleeve squeezed or cramped onto this end of the outermost cover *a*, to thereby firmly grip and hold same, the end *b'* of the innermost member in the case illustrated in Fig. 2 passing up against the inside of the pneumatic cylinder *j*, whereby the latter is raised, as in the case

of pneumatic pressure, or said end b' of the innermost member b may be attached to the slide l in the tube k, (see Fig. 3,) the arm l' attached to said slide being at its other end pivoted at m' to the lever m, by which the shutter is operated or released.

As shown in Fig. 1, it may be desirable to surround the end b' of the innermost member with a closely-coiled wire, (designated at $b^{\times}$,) which will serve to guide this end of the innermost member.

The open coiled spring c, forming the intermediate member, at one end bears against the sleeve h, to which the outermost member is attached, and at its other end said spring c bears against the end of the shank d of the push-button, which end is enlarged at f to form a stop which bears against an internal abutment or shoulder n, formed in the sleeve g, said coiled spring c being normally held in compression between the sleeve h and the said abutment n in the sleeve g in such wise that the flexible outermost member a is normally kept stretched to the utmost limit of its extensibility lengthwise by the action of said spring c, and, furthermore, as this spring c is arranged to act on the shoulder or innermost end of the shank d of the push-piece to which the innermost member b is attached, consequently said shank d is normally kept pressed outwardly with the stop f pressed against the abutment n, and thus the innermost member b is normally kept pressed outwardly in operative position—*i. e.*, in position for the operator to push same inward when it is desired to release or operate the shutter, &c.—and thus the coiled spring c not only serves as guide or means to enable the flexible innermost member to be slid or moved longitudinally with respect to the outermost member, as well as said intermediate member; but this intermediate member also, according to this invention, is arranged as a coiled spring with the dual purposes and having the following dual functions: First, it normally keeps the flexible outermost member (of the aforesaid character) stretched to the limit of its extensibility; and, second, it normally keeps the innermost member or the end of the push-piece thereon pressed outwardly in readiness for the operator to push same inward to operate the part or thing to be operated.

In the modification shown in Fig. 4 the outermost member a and the innermost member b are identical or similar in all respects to the members a and b described and shown in Fig. 1; but the intermediate member $c^{\times}$ in the modification illustrated in Fig. 4 is not arranged as a spring, but is formed as a closely-coiled wire which is interposed between the inner and outer members a and b, while an external spring o is arranged to act on the lever or arm p, pivoted at one end p', and at the other end p^2, pivoted to the end b' of the innermost member b, so that, as will be obvious, this spring o (carried on some fixed part of the frame of the thing to be operated) will serve the same dual functions as the spring c in Fig. 1—namely, to normally keep the outermost member stretched to the limit of its extensibility and to normally keep said innermost member pressed outwardly ready to be operated.

What I claim is—

1. Mechanism for the transmission of power in varying directions; comprising a flexible outer member which is compressible lengthwise and crosswise but is inextensible beyond its normal length, an inner member which is incompressible lengthwise and is adapted to slide within said outer member, means attached to said inner and outer members respectively at one end whereby said inner member may be pushed inward, means at the other end of said inner and outer members to attach the former to the part to be operated when the inner member is pushed inward as aforesaid, and a spring adapted to normally keep the outer member stretched to the limit of its extensibility and also adapted to normally keep the inner member pressed outwardly so as to be ready to be operated substantially as and for the purposes described.

2. Mechanism for the transmission of power in varying directions; comprising a flexible outer member composed of fibrous material which is compressible lengthwise and crosswise but is inextensible beyond its normal length, an inner member which is incompressible lengthwise and is adapted to slide within said outer member, means attached to said inner and outer members respectively at one end whereby said inner member may be pushed inward, means at the other end of said inner and outer members to attach the former to the part to be operated when the inner member is pushed inward as aforesaid, and a spring adapted to normally keep the outer member stretched to the limit of its extensibility and also adapted to normally keep the inner member pressed outwardly so as to be ready to be operated, substantially as and for the purposes described.

3. Mechanism for the transmission of power in varying directions; comprising a flexible outer member of braid which is compressible lengthwise and crosswise but is inextensible beyond its normal length, an inner member which is incompressible lengthwise and is adapted to slide within said outer member, means attached to said inner and outer members respectively at one end whereby said inner member may be pushed inward, means at the other end of said inner and outer members to attach the former to the part to be operated when the inner member is pushed inward as aforesaid, and a

spring adapted to normally keep the outer member stretched to the limit of its extensibility and also adapted to normally keep the inner member pressed outwardly so as to be ready to be operated substantially as and for the purposes described.

4. Mechanism for the transmission of power in varying directions; comprising a flexible outer member of braided fibrous material which is compressible lengthwise and crosswise but is inextensible beyond its normal length, an inner member which is incompressible lengthwise and is adapted to slide within said outer member, means attached to said inner and outer members respectively at one end whereby said inner member may be pushed inward, means at the other end of said inner and outer members to attach the former to the part to be operated when the inner member is pushed inward as aforesaid, and a spring adapted to normally keep the outer member stretched to the limit of its extensibility and also adapted to normally keep the inner member pressed outwardly so as to be ready to be operated substantially as and for the purposes described.

5. Mechanism for the transmission of power in varying directions; comprising a flexible outermost member which is inextensible lengthwise, a flexible innermost member which is incompressible lengthwise, and an intermediate member consisting of a coiled spring surrounding the innermost member and interposed between the latter and the outermost member and so connected at each end that the innermost member will thereby be maintained in operative position and adapted at the same time to normally keep the flexible outermost member stretched to the limit of its extensibility, substantially as and for the purposes described.

6. Mechanism for the transmission of power in varying directions; comprising a flexible outermost member which is inextensible lengthwise but is compressible crosswise a flexible innermost member which is incompressible lengthwise and an intermediate member consisting of a coiled spring surrounding the innermost member and interposed between the latter and the outermost member and so connected at each end that the innermost member will thereby be maintained in operative position and adapted at the same time to normally keep the flexible outermost member stretched to the limit of its extensibility substantially as and for the purposes described.

7. Mechanism for the transmission of power in varying directions; comprising a flexible outermost member which is inextensible lengthwise but is compressible crosswise, a flexible innermost member which is incompressible lengthwise and an intermediate member consisting of an open coiled spring surrounding the innermost member and interposed between the latter and the outermost member and so connected at each end that the innermost member will thereby be maintained in operative position and adapted at the same time to normally keep the flexible outermost member stretched to the limit of its extensibility, substantially as and for the purposes described.

8. Mechanism for the transmission of power in varying directions; comprising a flexible outermost member which is inextensible lengthwise, a flexible innermost member which is incompressible lengthwise, and an intermediate member consisting of a coiled spring surrounding the innermost member and so interposed between the latter and the outermost member as to engage that end of the innermost member which is to be acted on by the operator and the opposite end of said outermost member in such wise that the said end of the innermost member will be normally kept pressed outward and means to enable the operator to push inward said innermost member substantially as and for the purposes described.

9. Mechanism for the transmission of power in varying directions comprising a flexible outermost member composed of fibrous material which is inextensible lengthwise but compressible crosswise, a flexible innermost member which is incompressible lengthwise and an intermediate member consisting of a coiled spring surrounding the innermost member and so interposed between the latter and the outermost member as to engage that end of the innermost member which is to be acted on by the operator and the opposite end of said outermost member in such wise that the said end of the innermost member will be normally kept pressed outward and means to enable the operator to push inward said innermost member substantially as and for the purposes described.

10. Mechanism for the transmission of power in varying directions comprising a flexible outermost member of braid which is inextensible lengthwise a flexible innermost member which is incompressible lengthwise and an intermediate member consisting of a coiled spring surrounding the innermost member and so interposed between the latter and the outermost member as to engage that end of the innermost member which is to be acted on by the operator and the opposite end of said outermost member in such wise that the said end of the innermost member will be normally kept pressed outward and means to enable the operator to push inward said innermost member substantially as and for the purposes described.

11. Mechanism for the transmission of power in varying directions comprising a flexible outermost member of braided fibrous material which is inextensible lengthwise a

flexible innermost member which is incompressible lengthwise and an intermediate member consisting of a coiled spring surrounding the innermost member and so interposed between the latter and the outermost member as to engage that end of the innermost member which is to be acted on by the operator and the opposite end of said outermost member in such wise that the said end of the innermost member will be normally kept pressed outward and means to enable the operator to push inward said innermost member substantially as and for the purposes described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ARTHUR HENRY EDWARDS.

Witnesses:

H. D. JAMESON.

A. NUTTING.

United States Patent to

C. E. Duryea

No. 1,072,439 - granted September 9, 1913

C. E. DURYEA.

MECHANISM FOR TRANSMITTING POWER AND MOTION.

APPLICATION FILED MAY 9, 1913.

1,072,439. Patented Sept. 9, 1913.

Fig. 1.

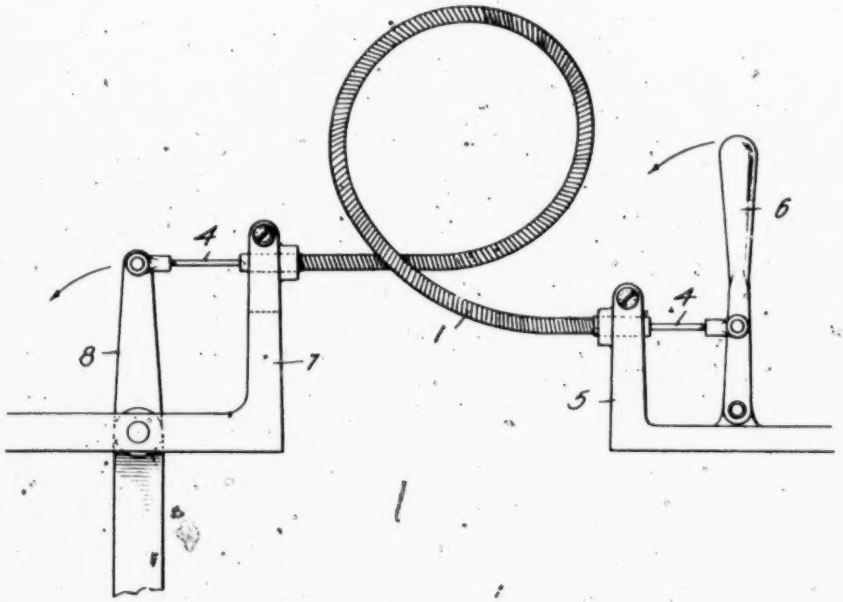


Fig. 2.

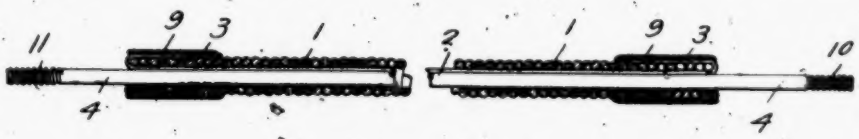


Fig. 3.

Witnesses

L. H. Schmidt.

R. R. Bond.

Inventor

CHARLES E. DURYEA,

By E. R. Bond

Attorney

UNITED STATES PATENT OFFICE.

CHARLES E. DURYEA, OF SAGINAW, MICHIGAN.

MECHANISM FOR TRANSMITTING POWER AND MOTION.

1,072,439. Specification of Letters Patent. Patented Sept. 9, 1913.

Application filed May 9, 1912. Serial No. 696,894.

To all whom it may concern:

Be it known that I, CHARLES E. DURYEA, a citizen of the United States of America, and resident of Saginaw, in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Mechanism for Transmitting Power and Motion, of which the following is a specification.

My invention relates to that class of devices intended to operate movable apparatus at some distance from the operating member and particularly in such cases as those wherein the operating and the operated positions are not in a positive relation to each other but vary in their distance so that usual operating members must be constructed with considerable complication to permit this varying distance.

My invention is designed more particularly as an improvement upon those devices consisting of a flexible incompressible member surrounding a flexible inextensible member quite commonly known as Bowden wire. My device, however, permits both pulling and pushing, whereas the common constructions permit only pulling on the inextensible member or in lieu thereof pushing on the incompressible member and in order to get motion in the opposite directions, either a second set must be used or springs at the opposite end to pull in the contrary direction must be employed. I overcome these objections by rendering the flexible outer member inextensible as well as incompressible and by using for the inner member a wire of high elasticity which, although sufficiently flexible for all common conditions, is sufficiently stiff to permit of both pulling and pushing to transmit the usual power required, such as to operate throttles of engines on automobiles, boats and aeroplanes or to operate brakes and do many such services.

Other objects and advantages of the invention will hereinafter appear and the novel features thereof will be particularly pointed out in the appended claims.

I accomplish the objects of my invention by the mechanism shown in the accompanying drawings, in which—

Figure 1 is an elevation showing one application of my improved push and pull wire. Fig. 2 is a sectional detail showing more specifically the construction of the novel member. Fig. 3 is a cross section through the member, on an enlarged scale.

Like numerals of reference indicate like parts throughout the different views.

Referring to the drawings, the incompressible member 1 is usually a coil of spring wire closely wound so that each coil rests against its next adjacent neighbor and thus it resists compression. While it is possible by the use of heavy wire wound under some torsion to make these coils press against each other with considerable force, there is always danger that they will be sprung apart and become longer than their original length with accompanying compressibility which is detrimental to the device. To prevent this stretching or lengthening, I pass through the coil 1 a single strand of wire 2 and fasten its ends to the ends of the coil 1, in any suitable manner, as shown at 3 in Fig. 2. It is now quite evident that the coil 1 cannot be extended unless the wire 2 is broken and it being of high grade spring wire will resist heavy pulls and yet be sufficiently flexible to permit usual movements like the motion of the bicycle handle bar or the action of the auto body on its springs. Since the coil 1 is now rendered inextensible by the wire 2 and is incompressible because its coils lie against each other, it is evident that the lineal distance between its ends measured along the axis of the coil 1 is constant even though the relation of the ends to each other in a straight line may be widely varied. It is also evident that if a wire 4 be passed through the coil 1, the amount of wire inside the coil will always be the same as the length of the coil, since both the coil 1 and the wire 4 are both incompressible and inextensible. It is, therefore, evident that if one end of the coil 1 is fastened to the bracket 5 carrying the operating handle 6 and the other end of 1 is fastened to the bracket 7 carrying the operated throttle lever 8 and the wire 4 is attached at its opposite ends to the levers 6 and 8 respectively, that the motion of the handle 6 in either direction, as indicated by the arrow will move the lever 8 in like direction, and to like amount, practically as though the handle of the lever 6 was attached to the lever 8 solidly. Further, that this perfect transferrence of movement in either direction takes place even though the bracket 5 may be widely moved or may be in motion with respect to the bracket 7.

It is evident that more than one wire 2 may be used inside the coil 1, or that more than one wire 4 may pass through the coil 1, the object of the multiple wires 2 being to secure additional strength and of the multiple wires 4 to operate additional devices from additional handles. The limit is, of course, the friction that may be induced by multiple wires rubbing on each other or the slight amount of lost motion which may arise from these wires not perfectly fitting the space in which they lie. It is usually common to fill the interstices of such a device with heavy oil or light grease to both protect from rust and moisture and to insure easy movement. The exact size of the apparatus and its amount of flexibility is a matter depending upon the amount of power to be transmitted, but for usual bicycle and auto engine throttles the wire 4 works well if about one-sixteenth inch diameter and the coil 1 if of three-sixteenth inch diameter. The thickness of the wire of which the coil 1 is formed is not very material so long as there is sufficient space inside the coil for the wire 4 and the wire 2 and in my device, which depends upon the wire 2 for the inextensibility of the coil 1, some weight and cost is saved by making the coil 1 of a wire of smaller diameter than can be used successfully with other methods.

The ends of the coil may be covered with rubber or other material 9 which also covers the attached ends of the wire 2, and the ends of the wire 4 may be attached to their respective members in any suitable way; for instance, the ends of the wire may be screw-threaded, as seen at 10 and 11, for connection with the handle 6 and lever 8, or these ends may be soldered or otherwise affixed in position.

From the foregoing, it will be seen that I have devised a very simple, yet efficient and durable member embodying the requisite amount of flexibility, yet so constructed as to be employed for both pushing and pulling, and while the structural embodiment of the invention as hereinbefore disclosed is what I at the present time consider preferable, it is evident that the same is subject to changes, variations and modifications in proportions, relative arrangement of parts, etc., without departing from the spirit of the invention or sacrificing any of its advantages. I, therefore, do not intend to restrict myself to the exact construction herein disclosed, but reserve the right to make such changes, variations and modifications as come properly within the scope of the protection prayed.

What is claimed as new is:—

1. A flexible power-transmitting ligament comprising a flexible non-compressible member, and a non-compressible non-extensible member movable therethrough, and inextensible means connecting the ends of said first-named member for holding the same against extension.

2. A power transmitting device comprising a non-compressible normally non-extensible hollow flexible member, inextensible means secured thereto for holding it against extension, and a non-compressible, non-extensible member slidably mounted within said hollow member.

3. A power transmitting device comprising a coiled member, means within the same joining its ends to prevent its extension, and a non-compressible, non-extensible member loosely received in said coil.

4. A power transmitting element comprising a flexible non-compressible member comprising a coil, an attaching member movable within the same, and means within and joining the ends of said coil for holding said coil against extension.

5. A power transmitting element comprising a flexible non-compressible member comprising a coil, an attaching member movable within the same, and means within and joining the ends of said coil for holding said coil against extension and compression.

6. A power transmitting element comprising a non-compressible, non-extensible element embodying a non-compressible non-extensible coil, inextensible means carried by and secured to the coil for holding the same against extension, and a non-compressible non-extensible member movable relatively to said coil.

7. A power transmitting element comprising a coiled member, a flexible non-extensible wire extending within the same and holding the coil against extension, and a non-compressible, non-extensible member loosely received within the coil.

Signed by me at Saginaw, Mich., this 6th day of May 1912.

CHARLES E. DURYEA.

Witnesses:
GEORGE GALLUP,
CARL E. ROGUER.

United States Patent to

Dakin & Underwood

No. 1,297,327 - granted March 18, 1919

49

E. W. DAKIN & E. E. UNDERWOOD.
SHUTTER OPERATING DEVICE.
APPLICATION FILED OCT. 15, 1917.

1,297,327. Patented Mar. 18, 1919.

Fig. 1

Fig. 2

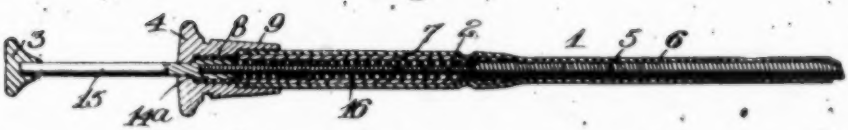


Fig. 3

WITNESSES:
Walter D. Cuyler
George D. Powell

INVENTORS
Edward W. Dakin
Ernest E. Underwood
BY
Their ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD W. DAKIN AND ERNEST E. UNDERWOOD, OF ROCHESTER, NEW YORK, ASSIGNORS TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

SHUTTER-OPERATING DEVICE.

1,297,327. Specification of Letters Patent. Patented Mar. 18, 1919.

Application filed October 15, 1917. Serial No. 196,611.

To all whom it may concern:

Be it known that we, EDWARD W. DAKIN and ERNEST E. UNDERWOOD, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Shutter-Operating Devices, and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings forming a part of this specification and to the reference numerals marked thereon.

Our present invention relates to photography and more particularly to shutter actuating devices of the type known as cable releases in which two laterally flexible members, one working within the other and terminating in relatively movable finger-pieces, are connected, respectively, to a shutter casing and an operating part thereof to afford a means for actuating the shutter without jarring the camera and in a convenient and comfortable manner and the invention has for its object to increase the flexibility of the members so that extreme distortions thereof will not result in permanent kinks or bends that would interfere with the relative sliding movement of the members. A further object of the invention is to improve the means of connecting the device to the shutter casing and to these and other ends the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a side view of a cable-release constructed in accordance with and illustrating one embodiment of our invention;

Fig. 2 is an enlarged longitudinal sectional view of the outer end of the device, and

Fig. 3 is a similar view of the inner end of the device.

Similar reference numerals throughout the several views indicate the same parts.

The device comprises an outer flexible casing or tubular guide indicated generally at 1 and an inner flexible cable 2 terminating at its outer end in a finger-piece 3. The outer end of the casing 1 is also provided with a finger-piece 4 and when these finger-pieces are pressed together the shutter is tripped or actuated as one of the members is connected to the shutter casing and the other to a controlling part of the shutter mechanism as will presently appear. In the present instance, the cable or inner member is a thrust member that is pushed against the shutter part and the casing takes the pull or reaction therefrom being connected to the shutter casing. The casing 1 must therefore be inextensible and to this end it embodies a helical wire coil 5 covered with a textile stocking 6 of inextensible weave. The outer end of the helix 5 is secured within the end of a sleeve 7 the opposite end of which is screwed into the finger-piece 4 at 8, while the stocking 6 is drawn over the sleeve 7 and secured between it and a collar 9 on the finger-piece 4 being preferably cemented to the sleeve.

At its inner end the casing 1 terminates in a tip indicated generally at 10. This tip preferably comprises an inner tube 11 threaded at 12 which threaded portion projects from a finger grip 13 in the form of a sleeve screwed onto the portion 12 to have a fixed relation to the tube. One end of the latter is reduced at 14 to receive the stocking 6 between it and the finger grip sleeve 13 which stocking is preferably cemented to the tube. By means of the part 13, the portion 12 of the tube 11 may be screwed into a suitable socket in the shutter casing. The inner end of the helix 5 abuts the end of the tube 11 being held there by the stocking.

The inner flexible cable 2 we also form of a closely wound incompressible wire helix which is extremely flexible laterally but is unyielding with respect to an endwise thrust against it. It is as flexible as the outer helix 5 and more so and hence will readily submit to any bending movement that its casing can undergo. At its outer end it is anchored in a head 14^a on the stem 15 of finger-piece 3 which stem is guided in finger-piece 4. A spring 16 coiled about the cable within the sleeve 7 bears at one end against said sleeve and at the other end against the head 14^a to normally hold the stem 15 and finger-piece 3 extended and the opposite end of the cable retracted, said head 14^a engaging against the finger-piece 4 to limit this movement.

The inner end of the cable 2 is fixed within a sleeve 17 shown in Fig. 3 as by prick punching said sleeve 17 at 18. This sleeve slides freely within the tube 11 the central bore of which is regular and continuous to

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provide a smooth guide. When the finger-pieces are pressed together and the cable is thrust through its casing the sleeve 17 constitutes an inflexible plunger of sufficient length to produce a direct thrust against the shutter operating member or trip without possibility of deflection.

A device constructed in accordance with our invention is efficient and serviceable and so supple as not to be disabled or its efficiency reduced by any twisting or bending which it would be apt to undergo even with careless use.

We claim as our invention:

1. In a shutter release, the combination with an outer flexible tubular casing and an inner flexible cable, both terminating at one end in finger-pieces one member being incompressible and adapted to act as a thrust member against a shutter part and the other inextensible to take the reaction therefrom as the finger-pieces are moved relatively, of a tip at the other end of the casing member comprising a threaded inner tube having a continuous inner surface affording a smooth guideway for the cable and an outer sleeve fixed thereto and constituting a finger grip from which the threaded portion of the tube projects to take attachment to a shutter casing.

2. In a shutter release, the combination with an outer flexible tubular casing and an inner flexible cable, both terminating at one end in finger-pieces, one member being incompressible and adapted to act as a thrust member against a shutter part and the other inextensible to take the reaction therefrom as the finger-pieces are moved relatively, and a covering on the casing, of a tip at the other end of the casing member comprising a threaded inner tube having a continuous inner surface affording a smooth guideway for the cable and an outer sleeve fixed thereto and constituting a finger grip from which the threaded portion of the tube projects to take attachment to a shutter casing, said sleeve also acting as a securing means for the casing cover.

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N° 13,157 A.D. 1905

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Complete Specification Left, 26th Jan., 1906—Accepted, 26th June, 1906

PROVISIONAL SPECIFICATION. AUG 14 1906

"Improvements in or relating to Flexible Mechanism for the Transmission of Power through Varying Directions and the Manufacture thereof".

We, CHARLES HENRY WATSON, of 313 High Holborn, London; Optician: and ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London; Engineer: do hereby declare the nature of this invention to be as follows:—

Heretofore mechanism has been employed for the purpose of transmitting motion or power in varying directions by means of two elements or members both of which must be flexible during operation and also such mechanism has been applied for releasing or operating photographic shutters see for example Bowden's Patent No. 25325 of 1896 Edwards Patents Nos. 12639 and 12812 both of 1901 and Edwards and Watson's Patents Nos. 5047 and 28792 both of 1903.

Now the present invention relates to mechanism for the transmission of power of the character wherein the outer of the two flexible members or elements is composed of a wire or wires spirally wound or coiled so as to form practically a tube or enclosing member within which the other member can slide.

Such power transmitting apparatus in some of its forms when employed for certain purposes such as for photographic shutter releases *etc.* is liable to unintentionally release the shutter should the apparatus get a pull or jerk accidentally owing to the fact that as heretofore constructed a certain amount of movement between the outer member can take place with respect to the inner member; and furthermore when the said outer member is made as heretofore of a closely coiled wire the coils of which are in contact throughout as heretofore this has the result that when the apparatus is flexed round a curve or curves (and especially when such curve is one of short radius) owing to the outer member being incompressible on the inside of the bend consequently the said outer member will necessarily expand or stretch or extend on the outer side of the bend with the further result that tension or a tendency to stretch is put upon the inner member or said inner member is caused to slide with respect to the outer member; and these drawbacks or objections this invention is designed (*inter alia*) to prevent or reduce.

A further object of this open coiling is to give the apparatus greater flexibility enabling it to be coiled up closely when not in use and to prevent stretching or damaging the outer cover or stocking or the inner member while being so coiled or while so coiled.

Now according to the present invention; the outer slidable member is made of a coiled wire or wires but the coils (though close) are not in actual contact when the apparatus is in its normal (unflexed) position but the coils are so spaced apart, formed, or arranged, that when the apparatus is flexed round a bend or curve of about the shortest radius for which the apparatus is designed or intended to be used, the coils will permit of their being compressed on the inside of the bend towards each other (until they touch) and this will consequently avoid stretching the outer member on the outer side of the bend or curve and thus obviate the aforesaid tendency to put tension on the inner member by the act of bending or flexing such apparatus and over this "open coiled" outer member and so as to act in conjunction therewith an additional and outermost cover or "stocking" is employed according to this invention which serves

furthermore to prevent any stretching movement relatively between the aforesaid inner member and the open coiled outer member; and thus prevents accidental release as aforesaid.

The aforesaid "open coiling" or specially proportioned coiling of the outer member according to the present invention may either be applied for the whole length of the outer member or only to a part or parts thereof as for example the outer member may be open coiled according to this invention only at the parts where it is liable to or required to be flexed while the retaining part or parts may be of any other suitable construction.

Furthermore at one or both ends of the coiled outer member—the wire may be opened out still more or so arranged as to serve as a coiled spring to keep the relative parts of the apparatus in their proper or normal position or restore same thereto.

Or in some cases the outer coiled member may be further opened out throughout its entire length, for instance, the apparatus may be so arranged that the inner member is operated by compression when the mechanism is operated while the outer "stocking" (which is inextensible) is put under the tension during such operation and the said further opened coiled member (attached to the inner member at a suitable point) serves—as a spring—to return said inner member to its original position.

Where necessary or desirable (for example where the flexible mechanism is of a considerable length) the outermost cover or stocking may advantageously be provided at any desired point or points with clips or binders such as circular rings or sleeves or short tubes which are crimped onto the aforesaid outer member or so attached thereto as to firmly hold and secure the said "stocking" or outermost cover in position on said outer member and thus prevent any relative longitudinal movement of these parts such as any tendency of the outermost cover to "creep".

In some cases the inner member (provided with the open-coiled outer member as aforesaid) may be located within an open coiled auxiliary cover (between the inner and outer member) which serves as a compression or tension spring to return the inner and outer members to their normal position relatively to one another.

Dated this 26th day of June 1905.

TONGUE & BIRKBECK,
Agents for the Applicants.

COMPLETE SPECIFICATION.

"Improvements in or relating to Flexible Mechanism for the Transmission of Power through Varying Directions and the Manufacture thereof".

We, CHARLES HENRY WATSON, of 313 High Holborn, London; Optician: and ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London; Engineer: do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

Heretofore mechanism has been employed for the purpose of transmitting motion or power in varying directions by means of two elements or members both of which are and must be flexible during operation see for example Bowden's British Patent No. 25325 of 1896 and Edwards' British Patent No. 12699 of 1901 and also such mechanism has been applied for releasing or

operating photographic shutters see Edwards' Patent No. 12812 of 1901 and Edwards & Watson's Patents Nos. 5047 and 28792 both of 1903.

Such power transmitting apparatus in some of its forms when employed for certain purposes such as for photographic shutter releases *etc.* is liable to unintentionally operate the part to which it is connected (for example unintentionally release the shutter) should the apparatus get a pull or jerk accidentally owing to the fact that as heretofore constructed a certain amount of movement of the outer member can take place with respect to the inner member; and furthermore when the said outer member is made as heretofore in some cases of a closely coiled wire the coils of which are in contact throughout this has the result that when the apparatus is flexed round a curve or curves (and especially when such curve is one of a short radius) owing to the outer member being incompressible on the inside of the bend consequently the said outer member will necessarily expand or stretch or extend on the outer side of the bend with the further result that tension or a tendency to stretch is put upon the inner member or said inner member is unintentionally caused to slide with respect to the outer member; and these drawbacks or objections this invention is designed (*inter alia*) to prevent or reduce.

We are aware that it has heretofore been proposed to employ an inner member or wire such as A with an open coiled outer member located within a rigid metal tube or non-flexible outermost covering and also we are aware that it has been proposed to employ an inner member or wire with an open-coiled outer member located within a sheath of rubber, gutta-percha or other suitable material, but none of these proposed constructions are the same as—or would answer the purpose of or accomplish the results obtained by—the present invention.

Now the present invention relates to mechanism of the aforesaid character for the transmission of power in varying directions wherein the outer of the two flexible members or elements is composed of a wire or wires spirally wound or coiled so as to form practically a tube or enclosing member which is incompressible crosswise (one or both of the said two members being adapted to slide upon or with respect to the other) and according to this invention the wire or wires forming such outer member is not only open coiled in the manner hereinafter more fully described but is also provided with an additional and outermost cover or stocking of textile material which is employed over said open coiled member this special additional or outermost cover being itself flexible and compressible transversely but inextensible lengthwise and thereby serves to prevent any stretching movement relatively between the aforesaid inner member and the open-coiled outer member.

According to the present invention; the said open coiled outer member of the two first-named members is made with the coils close together but not in actual contact when the apparatus is in its normal position (*i.e.* before flexing same), the coils being so spaced-apart, formed, or arranged, that when the apparatus is flexed round a bend or curve (of about the shortest radius for which the apparatus is designed or intended to be used) the coils will permit of their being pressed together until they touch or towards each other on the inside of the bend and this will consequently avoid stretching the outer member on the outer side of the bend or curve—and thus obviate the aforesaid tendency to put tension on the inner member by the act of bending or flexing such apparatus; and over this "open-coiled" outer member, and so as to act in conjunction therewith, the aforesaid additional and outermost cover or "stocking" of special construction is employed according to this invention which serves to prevent any stretching movement relatively between the aforesaid inner member and the open-coiled outer member; and thus prevents accidental release as aforesaid. while on the other hand the open-coiled member acts as a coiled spring under compression and tends to keep this outermost cover expanded or stretched to the limit of its extensibility; $\frac{\text{or}}{\text{and}}$ such outer cover may be kept in this stretched condition by means of a separate coiled spring inserted for this purpose if desired.

The aforesaid "open coiling" or specially proportioned coiling of the outer member according to the present invention may either be applied for the whole length of the outer member or only to a part or parts thereof as for example the outer member may be open-coiled according to this invention only at the parts where it is liable—or most required—to be flexed while the remaining part or parts may be of any other suitable construction.

Furthermore at one or both ends of the coiled outer member—the wire may be opened out still more or so arranged as to serve only at such end or end parts as a coiled spring to keep the relative parts of the apparatus in their proper or normal position or to restore same thereto.

Or in some cases for use with said flexible outermost stocking the outer coiled member may be further opened out throughout its entire length to serve as a spring to return said inner member to its original position and to maintain tension upon the stocking.

Where necessary or desirable (for example where the flexible mechanism is of a considerable length) the special outermost cover or stocking—which may be woven or laced or braided—may advantageously be provided at any desired point or points with clips or binders such as circular rings or sleeves or short tubes which are crimped onto the aforesaid outer members or so attached thereto as to firmly hold and secure the said special "stocking" or outermost cover in position on said outer member and thus prevent any relative longitudinal movement of these parts such as any tendency of the outermost cover to creep.

In some cases the inner member (provided with the open-coiled outer member as aforesaid) may be located within an open-coiled auxiliary cover (between the inner and outer members) which serves as a compression or tension spring to return the inner and outer members to their normal position relatively to one another.

Description of the Drawings.

Referring to the accompanying drawings:—

Fig. 1 is longitudinal sectional view of flexible mechanism in accordance with the present invention for the transmission of power in varying directions and Fig. 1ª is a local view on a greatly-enlarged scale of mechanism similar to Fig. 1 showing the operation of the open-coiled outer member when the mechanism is flexed.

Fig. 2 is longitudinal sectional view of a modified arrangement.

Fig. 3 is a similar view to Fig. 1 but showing the open-coiled outer member still further opened so as to act as a spring which will serve the dual purposes hereinafter described.

Referring now to Figs. 1 and 1ª of the drawings:—

In this arrangement the inner member A is attached to the sleeve A^2 by means of the cross-pin *a*. The outer member B is formed open-coiled as shown, one end thereof being inserted in the tubular end B^1 of the push-button B^2 while the other end B^3 of said open-coiled outer member is still further open-coiled so as to form a spring B^3 which latter acts against the head or collar A^1 fixed to the inner member A whereby said head end A^1 of the inner member is normally kept pressed outwardly to the limit of its movement by the push-button B^2 while when the sleeve A^2 is moved towards the push-button B^2 thereby tractive force is exerted upon the inner member A and the end A^1 is moved so as to compress the spring B^3 and is returned by the latter upon release of the buttons A^2 B^2.

It will readily be seen that when the inner and outer members A and B are flexed or bent round a curve the open coil will permit of this taking place without putting any strain upon the inner member A.

C is stocking or outermost cover of suitable textile material—advantageously a braided outer cover of fibrous material.

Z is collar or sleeve crimped over all so as to firmly lock and secure the braided outermost member C upon the coiled outer member B.

Referring now to Fig. 2:—

In this arrangement one end of the inner member A is attached to the push-button B^x while the outer member B at one end rests in a socket b^1 against the shoulder a^x in the sleeve A^x; while the other end of said outer member B is located in a fixed socket or sleeve D on the part or thing to be operated.

C is the outermost cover or stocking in this case formed of inextensible braided fibrous material which is fixedly secured at one end to the socket D and at the other end in the socket B^1.

E is an intermediate coiled spring inserted between the outer member B and the inner member A the latter being located within said interposed coiled spring which acts as a support or guide for said inner member A as well as acting as a spring which serves to keep and maintain the outermost cover C in a taut condition and also keeps the button normally pressed outwards.

It will thus readily be seen that upon the flange on the sleeve A^x on the button B^x being grasped and the button B^x pressed towards the flange thereby tractive force will be put upon the outermost cover C and as this is inextensible consequently pressure will be put upon the inner member A by the button B^x and thereby the inner member A will be forced along by the inward movement of the button B^x and consequently the spring E will be compressed and upon release of the button B^x will return the latter to its normal position as well as serving as guide for same as aforesaid—the outer member B which is open-coiled in accordance with this invention also serves the purpose of keeping the inextensible outer cover C taut as aforesaid.

Referring now to Fig. 3:

In this arrangement the inner member A is attached to the push-button A^{xx} which latter is pushed through the sleeve B^{xx} (*i.e.* in the direction of the inner member A) and thereby pressure is put upon the inner member A and the latter is operated by pressure in this case instead of by traction as in Fig. 1; but in this case (Fig. 3) the open-coiled outer member B is still further opened out throughout its entire length as illustrated (or this further opening out may be only for a part of its length if desired—as for example it may be still further opened for say a few inches at the end thereof adjoining the push button A^{xx}) and this open-coiled outer member B will then act as a spring which at one end will bear against the cramp Z which acts as a stop or shoulder which limits the expansion of said outer member B at this end—while at its other end said outer member B bears against the head or enlargement A^{xxx} on the push-button A^{xx} and thereby keeps said button A^{xx} normally pressed outwards and this enlargement A^{xxx} on its opposite side bears against the shoulder, B^{xx} on the sleeve B^{xx} and thereby tends to normally keep both the push-button A^{xx} and sleeve B^{xx} pressed in a direction away from the other end or cramp Z; such outward movement of these parts however being limited by the inextensible stocking C which is securely fastened at each end to said outer member, or as illustrated said stocking C may be secured at one end to and by the cramp Z and at the other end secured to the sleeve B^{xx} by the ring C^x cramped on the said sleeve B^{xx}.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. Flexible mechanism for the transmission of power in varying directions wherein the outer member, consisting of a coiled wire (or wires) such as B which encloses the inner member such as A) is formed wholly or mainly with said coils other than touching one another on the abutting faces thereof when the mechanism is in its normal position (*i.e.* when not flexed round a curve or curves) in combination and arranged to act in conjunction with an inextensible flexible stocking such as C of textile material, substantially as and for the purposes hereinbefore described.

2. In flexible mechanism for the transmission of power in varying directions of the character described, the employment of a coiled spring such as E (Fig. 2) interposed between the flexible inner member and the flexible outer member so as to serve the double purpose of acting as guide for the inner member and spring to restore the moving parts to their normal position which spring such as E may extend throughout the length of the flexible mechanism or only a part thereof in combination and arranged to act in conjunction with an inextensible flexible stocking such as C of textile material substantially in the manner and for the purposes hereinbefore described.

3. Flexible mechanism for the transmission of power in varying directions: comprising an inner and outer member (such as A and B) said outer member being incompressible cross-wise, and an inextensible-flexible outermost member such as C which is compressible lengthwise and crosswise and fitting over said outer member B, all the parts being constructed combined and arranged to act substantially in the manner and for the purposes hereinbefore described with reference to and as illustrated in Figs. 1 and 1ª, or Fig. 2, or Fig. 3 of the drawings hereunto annexed.

Dated this 26th day of January 1906

TONGUE & BIRKBECK,
Birkbeck Bank Chambers, Chancery Lane, London, W.C.
Agents for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1906.

Fig. 1.

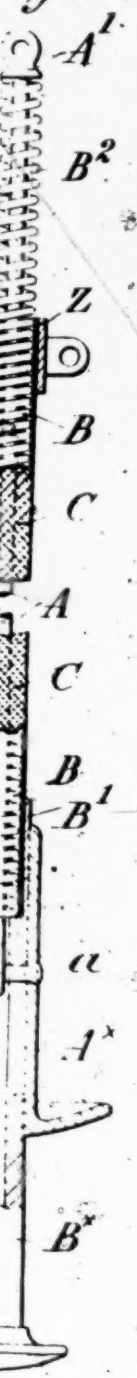


Fig. 2.

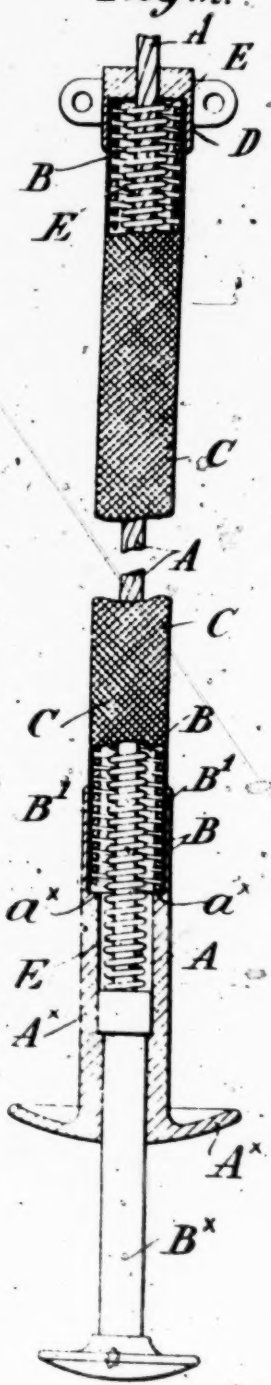


Fig. 3.

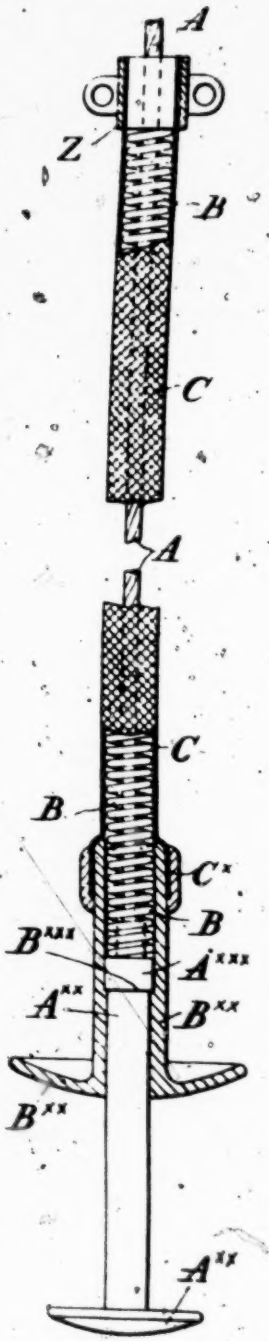
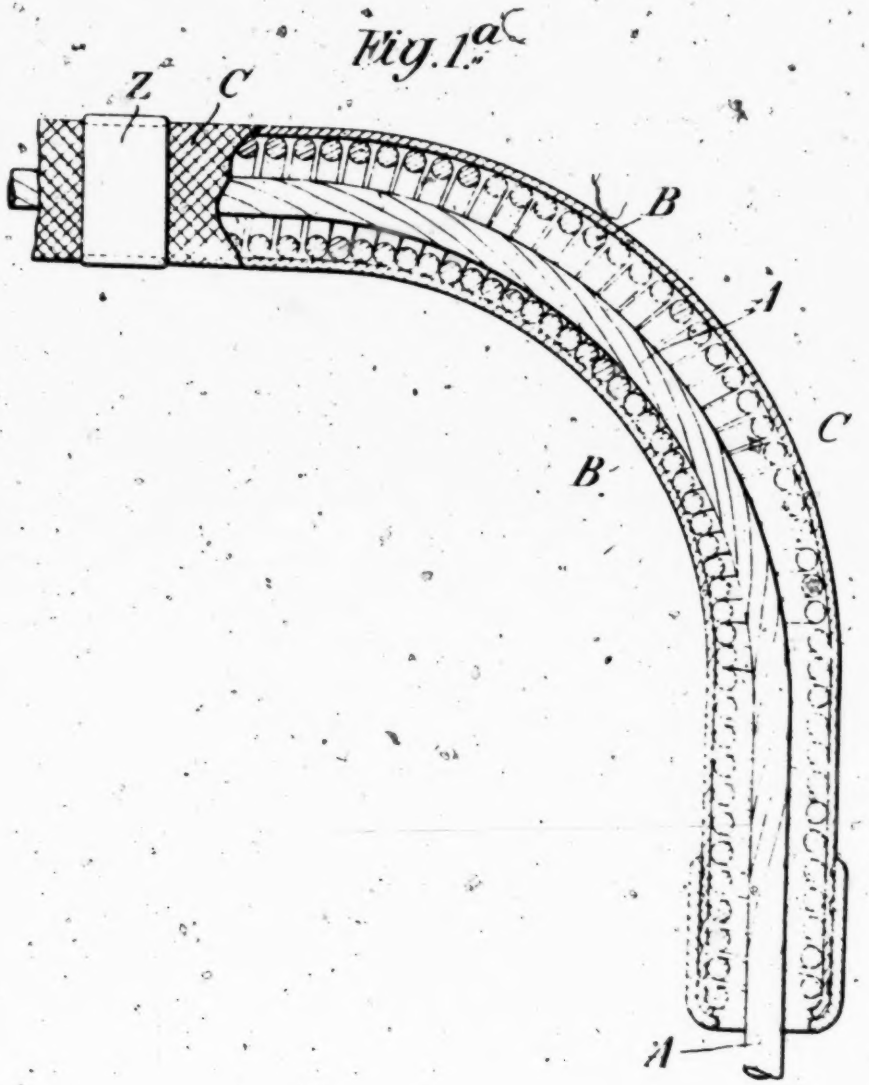


Fig. 1.ª



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Date of Application, 31st July, 1905

Complete Specification Left, 28th Feb., 1906—Accepted, 19th July, 1906

PROVISIONAL SPECIFICATION.

"Improvements in or relating to Apparatus or Mechanism for the Transmission of Power in Varying Directions."

We, ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London; Engineer; and CHARLES HENRY WATSON, of 313 High Holborn, London; Optician: do hereby declare the nature of this invention to be as follows:—

The object of this invention primarily is an improved power transmission apparatus especially suitable for photographic releases or other purposes where great flexibility is required.

According to one arrangement the outermost member is made of thread cord or wire advantageously plaited and *per se* is compressible lengthwise and may also even be compressible crosswise but inextensible lengthwise. One end of the said inextensible outermost member is passed over a sleeve or tube attached to a button or collar and is secured by any suitable means *e.g.* by a thimble, slid or cramped thereon; the other end of said outermost member is likewise secured to a second tube or sleeve carrying the means for attaching the apparatus in position such for example as a split thimble or similar attaching means which latter may if desired be loosely or otherwise jointed to the apparatus.

The innermost member may be formed of one or more wire or wires or of stranded wires or of wires held together by wire coiled round them or a closely coiled spiral and is attached at one end to a push button or push piece—for example passed at one end into the sleeve or shank thereof and there secured by compressing or denting said sleeve at one or more points—this push button or push piece being adapted to slide within or otherwise operate in conjunction with the first-named sleeve to which the outermost member is attached as aforesaid.

Between the said outermost and said innermost members a coiled spring or intermediate member is provided which presses against the end of or otherwise acts on the push piece or push button and thereby returns it to its normal position.

The said coiled spring or intermediate member is secured at the other or fixed end of the apparatus to the part or thing to be operated and in some cases may extend closely coiled beyond such point of its attachment as for example to form a guide for the said innermost member.

Means are provided on or in conjunction with the push piece (such as an enlargement on the sleeve) to prevent the said sleeve on said push piece being pushed back too far. Or this enlargement may be dispensed with and the same result obtained by attaching a bead or beads to the inner member or by other suitable means.

According to a modification the coiled spring or intermediate member between the innermost and outermost members serves to keep the outer member extended and a closely coiled extension on said coiled spring is attached to the innermost member so that the said extension will act as a check spring to return the innermost member to normal position.

[*Price* 8*d.*]

In another modification I may use a coiled spring, beads, or the like, between the innermost and outermost members merely as a guide for the inner member; or I may even dispense with said spring or beads altogether and any suitable spring at the fixed end being provided to return the innermost member to normal position—an enlargement being provided on the sleeve of the push-piece as before described.

In another arrangement the outer member is secured to the button or collar aforesaid while the push button or push piece is secured to both the innermost and outermost members so that when they are moved towards one another that part of the outermost member between said buttons will bunch up or compress and thereby allow movement with respect to each other to take place, a suitable spring being provided to keep the apparatus extended as before or the aforesaid "open coiled" spring or intermediate member may be arranged to act as aforesaid.

In applying this invention to operate photographic shutters of the character known as roller blind shutters such as the Thornton-Pickard type the innermost member may be arranged to push the lever (usually operated by pneumatic bulb) by means of a bell-crank-like lever.

Or the end of the innermost member may be formed spherical or provided with a ball or spherical part or the like adapted to engage in a cup or socket in the underside of a horizontally pivoted arm said pivoted arm or a nut or extension thereon being thus caused to release or otherwise engage the shutter releasing lever or shutter operating lever.

Or when used with the Unicum type of shutter the pneumatic cylinder may be removed and an attachment provided to hold one end of the outermost member. The innermost member being attached to the lever usually operated by the pneumatic cylinder or the inner projection of the finger trigger. A clip is provided, so that the release may be coiled round the shutter and the free end thereof held in said clip when not in use.

A simple and effective construction or arrangement and attachment to diaphragm shutters of the type known as automatic diaphragm shutters or Unicum shutters or the like consists according to this invention in attaching the end of the outermost member in a clip which may either be a spring clip or clamp or vice arrangement or the like so that such end is firmly and fixedly held while leaving the innermost member free to be forced through same by pressure the end of said member when thus acted on by pressure actuating the releasing lever or shutter operating lever to which it is attached direct as for example by means of a pivot pin the eye of which is pivoted to the shutter operating lever while the shank of said pin passes through a fixed guide which may advantageously be carried on the same mount which supports the clip or clamp to which the outermost member is secured as aforesaid the said mount also being provided if desired with a clip or device in which the outermost end of the "release" may be secured or in which same may rest when out of use: or this clip may be formed on other forms of releases.

According to another part of the present invention we may form the appliance or means for operating the aforesaid or any other apparatus for the transmission of power in various directions as follows:—

The shank of the push button or push piece is provided with a prolonged slot extending to or towards the free or inner end of said shank and the innermost member of the flexible transmission appliance is attached to a plate or device advantageously a flat stamping of rectangular form one arm of which extends up the interior of said shank or sleeve a spring being interposed between same and the end or push button itself to normally keep said device pressed outwards, while a part of the device which extends through the longitudinal slot and engages with and is secured to another sleeve provided with a collar or the like which latter sleeve slides freely on said shank of said push piece or push button which latter at its inner end is attached to the outer member

of the flexible transmission apparatus (for example by being cramped on to it either with or without an outer collar and provided with an inset or interior ridge above and below the collar on the end of the outer member—or it may be screwed and provided with a union or screwed socket) or if more than two members are employed then to the outermost member of said transmission apparatus.

A pawl may be provided on the outer sleeve or attached to the outer projection of the said stamping or to the sliding sleeve itself which will engage in notches in the push button shank when it is desired to keep the push button and the collar on the outer sleeve together or it can be thrown out of action when desired. This result may also be obtained by a jamming lever attached in the same way and cramping the outer sleeve and push button shank together.

It will thus readily be seen that when this apparatus is used in conjunction with an incompressible outer member or inextensible outermost member (or both) upon forcing the sleeve towards the said push button or head of the push piece thereby traction is put upon the innermost member (or wire) and the part to be actuated by the other end of the latter is thereby operated.

According to another modification the sleeve provided with the collar through which the push button or push piece slides as aforesaid may be provided with an interior annular ridge or ridges or other inset or insets to form an internal ledge or ledges or shoulder or shoulders *etc.* towards each end of said sleeve so as to thereby afford a bearing to the shank of the push piece and act as stop or limit the outward movement of said push piece the inner end of the shank of which latter may be enlarged or provided with an enlargement or head or other means adapted to engage the said inset or interior ridge *etc.* and similarly towards the other end of said sleeve (with collar thereon) same is provided with similar interior annular ridge or ridges or other inset or insets or the like that will serve to grip or hold the outermost member (or outer member if only two members are employed in the transmission apparatus) and the spring or winding forming the intermediate member may if desired be open coiled in accordance with our Application for Patent dated 26th June 1905 No. 13157; or and the end of said coiled intermediate member may be extended as a spring between the push piece and the outermost member or a separate spring may be inserted to normally keep the push piece or push button and the sleeve with collar held apart from one another.

Dated this 31st day of July 1905.

TONGUE & BIRKBECK,
Agents for the Applicants.

COMPLETE SPECIFICATION.

"Improvements in or relating to Apparatus or Mechanism for the Transmission of Power in Varying Directions"

We, ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London; Engineer: and CHARLES HENRY WATSON, of 313 High Holborn, London; Optician: do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The object of this invention primarily is an improved power transmission apparatus especially suitable for photographic releases or other purposes where great flexibility is required.

According to one arrangement the outermost member is made of thread cord or wire advantageously braided or plaited and *per se* is inextensible lengthwise but is or may be compressible lengthwise and may also be compressible crosswise. One end of the said inextensible outermost member is passed over a sleeve or tube attached to a button or collar and is secured thereto by a thimble, slid or cramped thereon; the other end of said outermost member is similarly secured to another tube or sleeve carrying the means for attaching the apparatus in position such for example as a split thimble or similar attaching means which latter may if desired be loosely or otherwise jointed to the apparatus.

The innermost member may be formed of one or more wire or wires or of stranded wires or of wires held together by a wire coiled round them or a closely coiled spiral and is attached at one end to a push button or push piece—for example passed at one end into the sleeve or shank of said push button & there secured by compressing or denting said sleeve at one or more points—this push button or push piece being adapted to slide within or otherwise operate in conjunction with the first-named sleeve to which the outermost member is attached as aforesaid.

Between the said outermost and said innermost members a coiled spring or intermediate member is provided which presses against the end of or otherwise acts on the push piece of push button and thereby returns it to its normal position.

The said coiled spring or intermediate member is secured at the other or fixed end of the apparatus either directly or indirectly to the part or thing to be operated or otherwise suitably secured and in some cases may extend closely coiled beyond such point of its attachment as for example to form a guide for the said innermost member.

Means are provided on or in conjunction with the push piece (such as an enlargement on the sleeve) to prevent the said sleeve on said push piece being pushed back too far. Or this enlargement may be dispensed with and the same result obtained by attaching a bead or beads to the inner member or by other suitable means.

According to a modification the coiled spring or intermediate member between the innermost and outermost members serves to keep the outer member extended and a closely coiled extension on said coiled spring is attached to the innermost member so that the said extension will act as a check spring to return the innermost member to normal position.

In another modification we may use a coiled spring, beads, or the like, between the innermost and outermost members merely as a guide for the inner member; or we may dispense with said spring or beads altogether and provide any suitable spring at the fixed end to return the innermost member to normal position—an enlargement being provided on the sleeve of the push-piece as before described.

In another arrangement the outer member is secured to the button or collar aforesaid while the push-button or push-piece is secured to both the innermost and outermost members so that when they are moved towards one another that part of the outermost member between said buttons will bunch up or compress and thereby allow movement (of the push-pieces) with respect to each other to take place, a suitable spring being provided to keep the apparatus extended as before or the aforesaid "open coiled" spring or intermediate member may be arranged to act as aforesaid.

In applying this invention to operate photographic shutters of the character known as roller blind shutters such as the Thornton-Pickard type the innermost member may be arranged to push the lever (usually operated by pneumatic bulb) by means of a bell-crank-like lever.

Or the end of the innermost member may be formed spherical or provided with a ball or spherical part or the like adapted to engage in a cup or socket in the underside of a horizontally pivoted arm said pivoted arm or a nut or

extension thereon being thus caused to release or otherwise engage the shutter releasing lever or shutter operating lever.

Or when used with the Unicum type of shutter the pneumatic cylinder may be removed and an attachment provided to hold one end of the outermost member. The innermost member being attached to the lever usually operated by the pneumatic cylinder or the inner projection of the finger trigger. A clip is provided, so that the release may be coiled round the shutter and the free end thereof held in said clip when not in use.

A simple and effective construction or arrangement and attachment to diaphragm shutters of the type known as automatic diaphragm shutters or Unicum shutters or the like consists according to this invention in attaching the end of the outermost member in a clip which may either be a spring clip or clamp or vice arrangement or the like so that such end is firmly and fixedly held while leaving the innermost member free to be forced through same by pressure the end of said member when thus acted on by pressure actuating the releasing lever or shutter operating lever to which it is attached direct as for example by means of a pivot pin the eye of which is pivoted to the shutter operating lever while the shank of said pin passes through a fixed guide which may advantageously be carried on the same mount which supports the clip or clamp to which the outermost member is secured as aforesaid the said mount also being provided if desired with a clip or device in which the outermost end of the "release" may be secured or in which same may rest when out of use.

According to another modification the sleeve provided with the collar through which the push button or push-piece slides as aforesaid may be provided with an interior annular ridge or ridges or other inset or insets to form an internal ledge or ledges or shoulder or shoulders *etc.* towards each end of said sleeve so as to thereby afford a bearing to the shank of the push-piece and act as stop or limit the outward movement of said push-piece the inner end of the shank of which latter may be enlarged or provided with an enlargement or head or other means adapted to engage the said inset or interior ridge *etc.* and similarly towards the other end of said sleeve (with collar thereon) same is provided with similar interior annular ridge or ridges or other inset or insets or the like that will serve to grip or hold the outermost member (or outer member if only two members are employed in the transmission apparatus) and the spring or winding forming the intermediate member may if desired be open coiled in accordance with our Application for Patent dated 26th June 1905 No. 13157; or and the end of said coiled intermediate member may be extended as a spring between the push-piece and the outermost member or a separate spring may be inserted to normally keep the push-piece or push-button and the sleeve with collar held apart from one another.

According to another part of the present invention we may form the appliance or means for operating the aforesaid or any other apparatus for the transmission of power in various directions as follows:—

The shank of the push-button or push-piece is provided with a prolonged slot extending to or towards the free or inner end of said shank and the innermost member of the flexible transmission appliance is attached to a plate or device advantageously a flat stamping of rectangular form one arm of which extends up the interior of said shank or sleeve a spring being interposed between same and the end or push-button itself to normally keep said device pressed outwards, while a part of the aforesaid plate or device extends through the longitudinal slot and engages with and is secured to another sleeve provided with a collar or the like which latter sleeve slides freely on said shank of said push-piece or push-button which latter at its inner end is attached to the outer member of the flexible transmission apparatus (for example by being cramped on to it either with or without an outer collar and provided with an inset or interior

ridge above and below the collar on the end of the outer member—or it may be screwed and provided with a union or screwed socket) or if more than two members are employed then to the outermost member of said transmission apparatus.

A pawl may be provided on the outer sleeve or attached to the outer projection of the said plate or stamping or to the sliding sleeve itself which will engage in notches in the push button shank when it is desired to keep the push button and the collar on the outer sleeve together or it can be thrown out of action when desired. This result may also be obtained by a jambing lever attached in the same way and cramping the outer sleeve and push button shank together.

It will thus readily be seen that when this apparatus is used in conjunction with an incompressible outer member or inextensible outermost member (or both) upon forcing the sleeve towards the said push button or head of the push-piece thereby traction is put upon the innermost member (or wire) and the part to be actuated by the other end of the latter is thereby operated.

In the accompanying drawings we have illustrated various alternative forms of mechanism according to the present invention for the transmission of power in varying directions.

Referring to Figs. 1 to 3:—

a is the innermost member which is inextensible and incompressible.

b is the coiled spring or intermediate member which is incompressible crosswise but is extensible and compressible lengthwise.

c is the outermost member which is so formed (for example of braid) as to be inextensible lengthwise but is or may be compressible lengthwise $\frac{\text{or}}{\text{and}}$ crosswise; and which outermost member we will refer to as the "stocking".

The innermost member *a* is attached at one end to the shank d^1 of the push button *d* which shank d^1 at its inner end is provided with a flange d^2 which limits the outward movement of said push button *d* by engaging the annular ledge or shoulder e^3 formed internally in the sleeve e^1 provided with the external flange *e* which latter is adapted to be grasped by the fingers of the person operating the push button *d*.

The end of the coiled spring *b* bears on the flange d^2 Fig. 1 (in Fig. 2 said coiled spring bears against a washer d^3 which is used in place of said flange d^2 Fig. 1 which washer d^3 may be loose in which case a collar a^1 is cramped on the innermost member *a* as shown in Fig. 2) and consequently tends to keep the push button *d* pressed outwards and thereby also tends to keep the outermost member or stocking *c* stretched to the extreme limit of its length *i.e.* so as to keep it taut.

In Fig. 3 the coiled spring *b* bears directly against the internal ledge e^3 of the sleeve e^1 and in other respects acts the same as in Figs. 1 and 2.

In all the arrangements shown in Figs. 1, 2, and 3, one end of the stocking *c* is passed over the sleeve e^1 and secured by a thimble or collar *f* fitting thereover tightly onto the said sleeve *e*.

This thimble *f* may be cramped onto the sleeve e^1 or *vice-versa* or said sleeve and thimble may be otherwise securely fixed to one another so as to securely and permanently fix the said end of the stocking in between same; or instead of cramping together said thimble *f* and sleeve e^1 they may be arranged to secure the end of the stocking between them as follows:—

The thimble *f* $\frac{\text{or}}{\text{and}}$ the sleeve e^1 may be made tapering or partly tapering and of such relative sizes in bore and external diameter respectively that when the stocking end has been passed over the sleeve it will be possible to slide or force the thimble thereover but same will make such a tight fit and so compress the stocking end between them that none of the parts will afterwards separate; or as an extra precaution or for greater security one or both ends of the thimble may be slightly turned inwards $\frac{\text{or}}{\text{and}}$ provided with a serrated edge or

teeth or the like at the end which will engage in or with the stocking and obviate all possibility of the thimble coming off; or and if desired the exterior of the sleeve e^1 (where the end of the stocking is passed over same) may be corrugated ridged or roughened to further assist in holding these parts together.

At or towards the opposite end of the mechanism the other end of the outermost member or stocking c is similarly secured as aforesaid by a thimble or collar q fitting tightly thereover onto the sleeve h which is provided with spring arms or prongs i for attaching the mechanism to the thing to be operated such as to the ordinary pneumatic release mechanism on a photographic shutter.

In Fig. 1 the coiled spring b has the collar q cramped thereon and beyond this point extends freely through the said sleeve or mount but in Figs. 2 and Fig. 3 the sleeve h is cramped tightly onto the coiled spring b while in Fig. 3 said coiled spring b is secured onto the innermost member a by a short sleeve or collar k which cramps the said spring b onto said member a—in which case the coiled spring b will tend at both ends of the innermost member a to press or return the latter in the direction of the push-button d.

In all cases the intermediate member b is shown "open coiled" so as to freely permit of the mechanism being bent or flexed without putting any undue strain on the innermost member—as set forth in our Patent Application No. 13157 of 1905.

Referring now to Fig. 4;

In this figure we have shown similar mechanism to Fig. 2 except that the intermediate member b is not an open coiled spring and is not arranged at its end to act as a coiled spring and is not clamped to the sleeve e^1; the spring m to act on the innermost member a (to tend to keep the push-button d pressed outwards and to keep the stocking c in a taut condition) being provided in this case on the lever l which controls the thing to be operated such as a photographic shutter (not shewn) which lever l has the inner member a attached to it, and is provided with the spring m such as shown which tends to normally force the inner member a towards the push-button d.

Referring now to Fig. 5:—

In this case the outermost member or stocking c instead of terminating at the sleeve e^1 extends beyond said sleeve and is secured by the collar or thimble f which in this case (in a similar manner as aforesaid) secures the end of the stocking to the shank of the push-button d instead of to the sleeve e^1, and in the case illustrated in Fig. 5 the stocking is also secured at a separate point between the sleeve e^1 and the collar n—the stocking c being thus secured at this point between n and d^1 as well as secured by the thimble f; and that part of the stocking c^2 which lies between these two points of attachment, while free to be compressed when the button d is pushed inwards, will on the other hand serve to limit the outward movement of said push-button d, and the open coiled spring b consequently serving through the stocking part c^2 to keep the stocking c taut throughout its length.

Fig. 6 illustrates the application of the release mechanism constructed in accordance with the present invention to the well-known type of roller blind shutters having the thimble f by which the stocking c is secured to the mount o on an extension o^1 of which there is hinged the angle-piece p one arm p^1 of which passes behind the arm q of the releasing lever of the well-known pattern employed on roller blind shutters.

—Thus when pressure is applied by means of the inner member a to the angle-piece p thereby the lever q is operated and the shutter released.

Referring now to Fig. 7:—

In this arrangement one end of the stocking c is cramped by means of the collar n on to the open coiled spring b and then the sleeve e^1 is cramped onto or otherwise secured to said collar n said sleeve e^1 being provided with an

enlarged portion e^2 so as to permit the flanged end d^2 on the shank d^1 of the push-button d to slide up and down therein.

The open coiled spring b acting as before described to normally keep the push-button d forced outwardly & keep the stocking c taut; the other end of said stocking c being secured by the thimble f as aforesaid—to the sleeve h carrying the prongs i for attachment of the mechanism as aforesaid, said sleeve h being cramped to the open coiled wire b as aforesaid.

In Fig 8: The stocking c is secured between the sleeve e^1 and the collar n as in Fig. 5 by cramping the sleeve e^1 on to said collar n with the stocking thereinbetween; but in this arrangement the stocking is not extended below the sleeve e^1 and furthermore the coiled spring b is dispensed with in this part of the mechanism: the other end of the stocking is secured as before described by the thimble f on the sleeve h which latter moreover is cramped on to the coiled spring b^2 which at its upper end is securely attached to the inner member a as for example by cramping said spring on to the outermost part of the inner member a by means of a cap a^{22}.

This spring b^2 will thus serve to keep the inner member a normally pressed towards the push-button d and consequently will normally keep the stocking c in a taut condition.

In all the arrangements illustrated it will thus be seen that the outermost member or stocking c is very readily attached and is kept in a taut condition so that the release mechanism can act by pressure and not by traction.

Referring now to Fig. 9:—

In this arrangement the release mechanism is shown fitted to a shutter of the type known as self-setting or automatic shutters; an open coiled spring b being employed as in Figs. 1 to 7 and the end of the stocking c in this case is passed inside the sleeve h which is split towards the end where it receives the stocking c and after the latter has been passed inside it said end of the sleeve h is cramped on to the coiled wire b so as to thereby securely attach its end to the stocking c.

The sleeve h in this case is carried on a mount s which is screwed to the framework of the shutter a spring clip (for holding the other end of the release when out of use) being formed by the jaws s^1 which may advantageously be turned up out of the substance of the mount s.

Referring now to Figs. 10 to 17 which illustrate the invention as applied for producing traction of the innermost member a (instead of pressure as in Figs. 1 to 9) and also show clutches or devices for locking the operating parts together in any desired position:—

In Figs. 10 and 11: The innermost member a is attached to the plate or device 1 which is provided with a nose 2 adapted to pass through the slot 3 in the shank or sleeve e^1 provided with a flange e this plate or device 1 which may advantageously be a flat stamping and may be also provided with an arm or extension 4 adapted to pass within the coiled spring 5 located within the sleeve d^1 of the button d by means of which the said button d and flange e are kept normally pressed apart.

In Fig. 11 the push-button d d^1 is shown detached from the other parts which are combined together by passing the shank d^1 through the sleeve e^1 and then cramping the end of said shank d^1 on to the collar 6 between which latter and the coiled wire b the stocking c is secured namely by cramping the said collar 6 on to the coiled wire b with the stocking thereinbetween see Fig. 10.

The shank d^1 of the push-piece d is provided with the prolonged slot 7 to enable same to slide past the nose 2 of the flat stamping 1.

In Fig. 12:—A clutch or gripping device is shown for locking the shank of the push-piece d^1 to the sleeve e^1 namely the nose 2 of the plate 1 is extended to a short distance outside the sleeve e^1 and has pivoted thereto at 8 the cam-piece or locking device 9 the cam part 10 of which rides up against the plate or bridge-piece 11 the turned down ends of which pass through the sleeve e^1

and bear against the shank d^1 and force the latter against the opposite side of the interior of the sleeve e^1 so as to thereby lock the two parts d^1 e^1 together in suchwise as to prevent relative longitudinal movement and thus the inner member *a* can be held and locked in any desired position as for example when the shutter is in mid-position *i.e.* fully open to give a prolonged exposure.

Fig. 12 also shows another way of attaching the operating device to the flexible stocking namely the latter is secured between the collar 6 and the coiled wire *b* by cramping same together as in Fig. 10 a loose narrow collar 12 being inserted between this cramp on the collar 6 and an annular inset 13 formed in the shank d^1 of the push-piece *d* the end of said shank d^1 being passed over said collars 12 and 6 and the internally screwed collar 14 provided with a shoulder 15 is then screwed on to the externally screw-threaded end of said shank d^1 until the shoulder 15 meets said end and thus these parts are all securely attached together.

In Fig. 13 the clutch or gripping device 16 is pivoted at 17 to the extension of the nose 2 on the plate 1 and acts against a bridge-piece 18 fixed on the sleeve e^1 so as to thereby force the shank d^1 towards the clutch device or gripping device instead of forcing same away therefrom as in Fig. 12.

The attachment of the shank d^1 to the stocking *c* is similar to the arrangement shown in Fig. 10.

In Fig. 14 an arrangement is shown in which the nose 2 of the flat stamping or plate 1 has pivoted thereto at 19 the bent lever 20, 21, the arm 20 of said lever being normally kept pressed outwards by the spring 22 whereby the bent end 21 of said lever is normally kept forced against the shank d^1 of the push-button *d* which passes through the sleeve e^1 as shown.

This arrangement permits the shank d^1 of the push-button *d* to be readily forced inwards through the sleeve e^1 in the direction of the arrow *z* but the relative return movement of the parts is prevented by said spring levers 20, 21, until the latter is disengaged from the shank d^1 by pressing on the end 20 of said lever.

In Fig. 15 the shank d^1 and the sleeve e^1 are locked together by forming the sleeve e^1 with one or more longitudinal slots 23 and providing an internally tapered and screw-threaded collar 24 to screw on said sleeve e^1 so that by screwing up this tapered collar 24 it will compress the split end of said sleeve e^1 to the shank d^1 to thereby firmly lock the two together; a modified form of this arrangement being shown in Fig. 16 (of which Fig. 17 is an end view on line 17—17—Fig. 16) wherein a split collar 25 is mounted between the fixed collars 26 on the split sleeve e^1 and to the ends of said split collar 25 is pivoted at 27 the clutch or locking lever 28 the nose 29 of which serves to draw up said split collar 25 and compress the split end e^1 of the sleeve so as to thereby grip and lock the shank d^1 of the push-piece *d*.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. In mechanism for the transmission of power in varying directions wherein the inner flexible member is incompressible and is adapted to slide within an outer flexible member which is inextensible the herein described method of securing the said flexible outer member or "stocking" (such as *c*) to the other parts of the mechanism, which consists in passing the end of said stocking over a sleeve on the part to which it is to be attached and then sliding a thimble over said stocking and sleeve so as to thereby firmly secure said stocking between the thimble and sleeve—either with or without cramping the thimble and sleeve together, with the other parts of said mechanism all mounted and secured together, substantially as and for the purposes set forth.

2. Constructing flexible mechanism for the transmission of power in varying directions in accordance with Claim 1, with an open coiled spring interposed

between the said "stocking" (such as *g*) and the said inner member (such as *a*) substantially as and for the purposes hereinbefore described.

3. The improved mechanism for the transmission of power in varying directions arranged and constructed as specified with the outermost member or stocking such as *g* secured to the part to which it is to be attached by passing said stocking over a sleeve such as e^1 or *h* and then sliding a thimble such as *f* over said stocking and sleeve so as to firmly secure the stocking between said thimble and sleeve—either with or without cramping said thimble onto said sleeve—and the other parts of the mechanism all mounted combined and arranged to operate substantially as and for the purposes hereinbefore described with reference to and as illustrated in the respective Figs. 1 to 9 of the drawings hereunto annexed.

4. In flexible mechanism for the transmission of power in varying directions wherein the flexible inner member is inextensible and adapted to slide within the outer member (or members) which is incompressible; the attachment of the inner member such as *a* to, and the employent of, a plate or device such as 1 located in the sleeve such as e^1, a push-piece such as *d* with shank d^1 adapted to slide through said sleeve such as e^1, a prolonged slot such as 7 in said shank d^1, and a nose or projection such as 2 on said plate or device such as 1 adapted to pass freely through said prolonged slot 7 in the shank d^1 into engagement with the sleeve e^1 either with or without an extension or arm 4 on said device 1 and a spring such as 5 held under compression in the shank d^1 substantially as and for the purposes hereinbefore described.

5. In flexible mechanism for the transmission of power in varying directions wherein the flexible inner member is inextensible and adapted to slide within the outer member (or members) which is incompressible; the herein described means for attaching said inner member such as *a* to the operating mechanism substantially as hereinbefore described with reference to and as illustrated in Figs. 10 and 11 of the drawings hereunto annexed.

6. In flexible mechanism for the transmission of power in varying directions wherein the flexible inner member such as *a* is connected to the external sleeve e^1 by which latter said member is caused to operate (by traction) through the intervention of a plate or device such as 1, 2, as claimed in above Claim 4, the arrangement and use in combination therewith of a clutch or gripping device for locking the shank d^1 of the push-button such as *d* to the operating sleeve such as e^1, substantially as hereinbefore described with reference to and as illustrated in the respective Figs. 12 to 17 of the drawings hereunto annexed.

Dated this 28th day of February 1906.

TONGUE & BIRKBECK
Birkbeck Bank Chambers, Chancery Lane, London, W.C.
Agents for the Applicants

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SHEET 1

Fig.1.

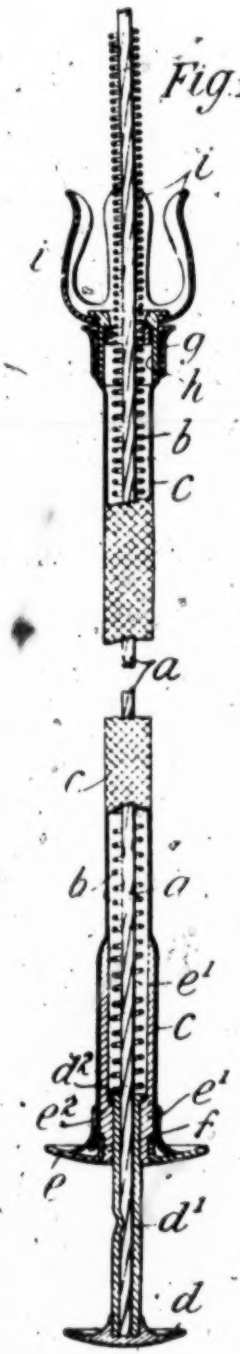


Fig.2.

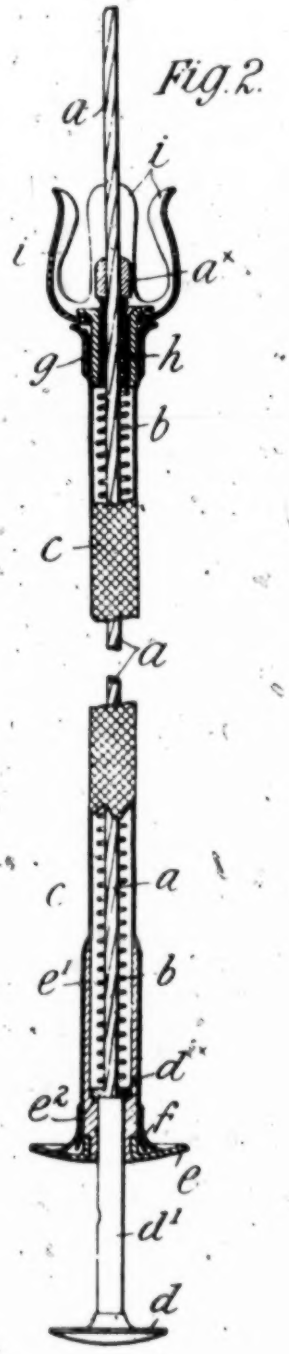
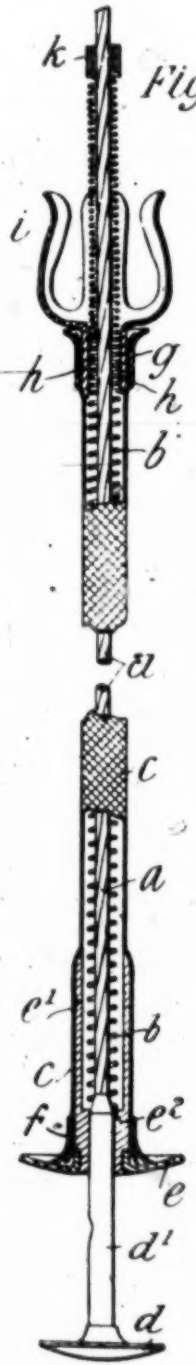


Fig.



SHEET 2

Fig.4.

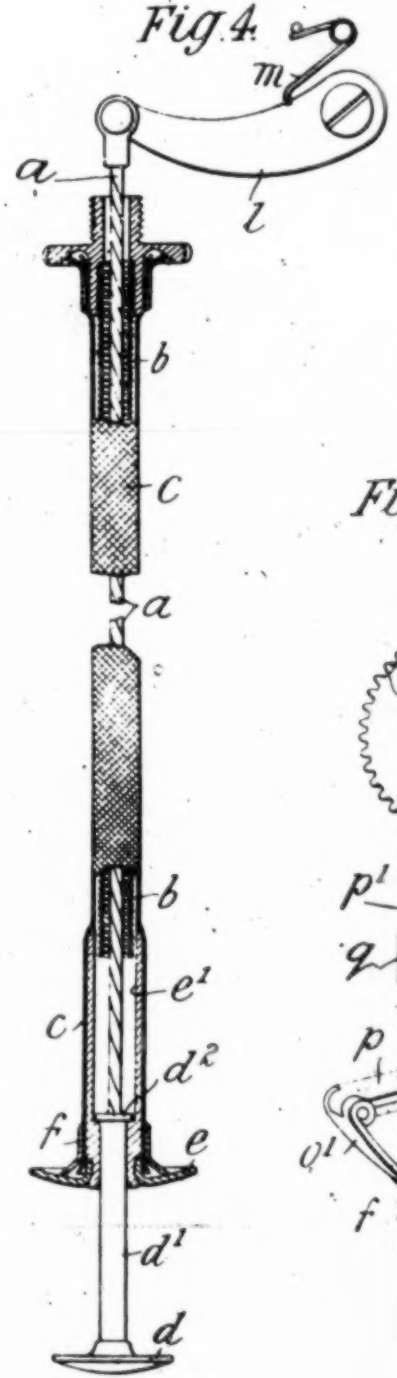


Fig.5.

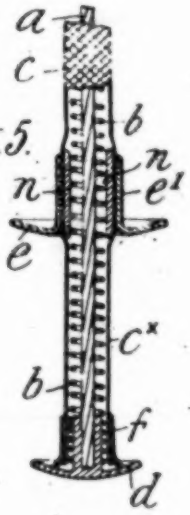


Fig.6.

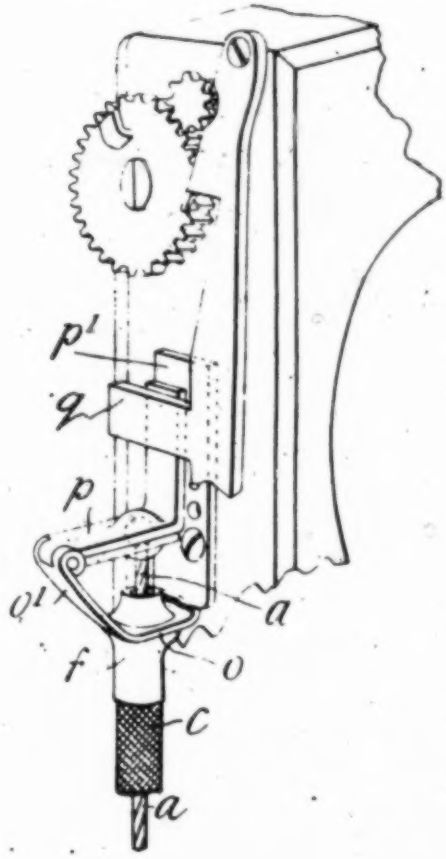


Fig.7.

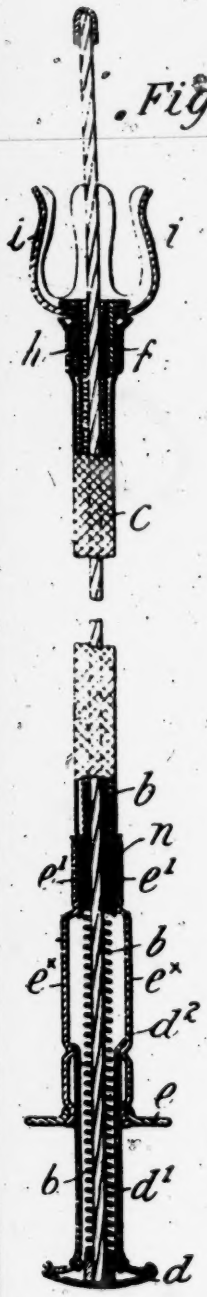


Fig.8.

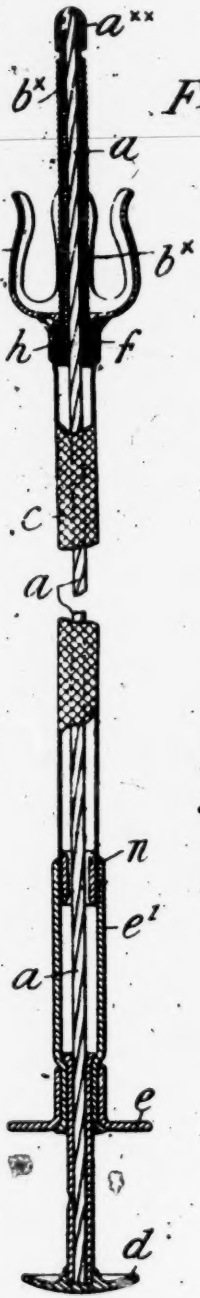


Fig.9.

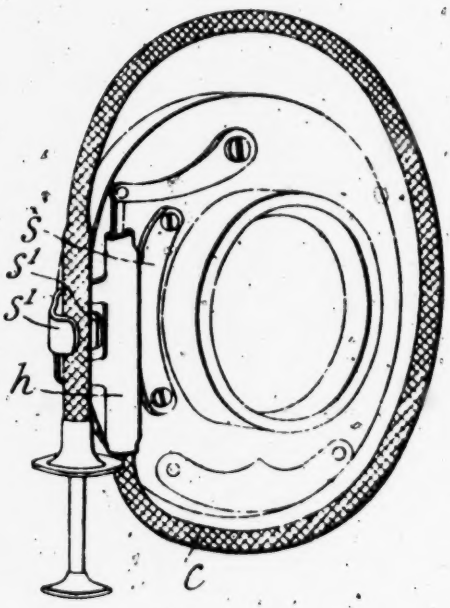


Fig. 10.

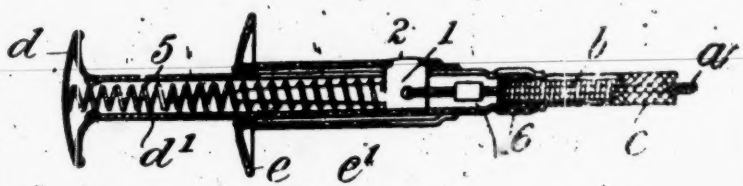


Fig. 11.

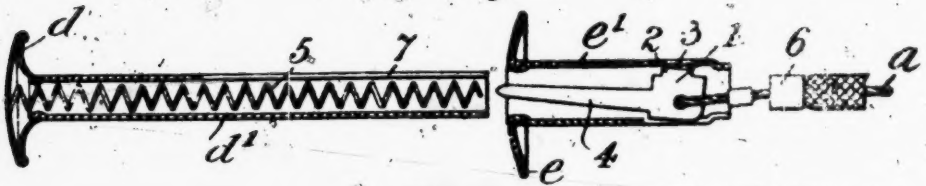


Fig. 12.

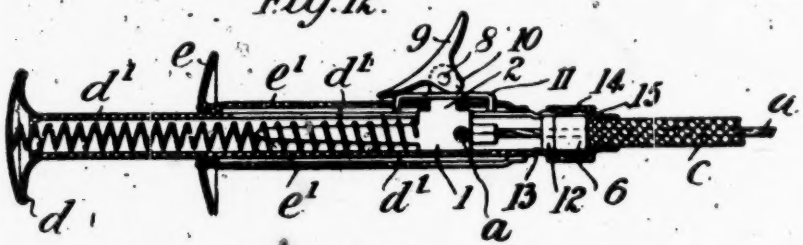
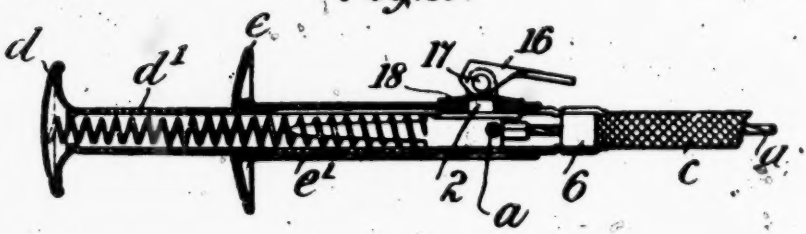


Fig. 13.



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 14

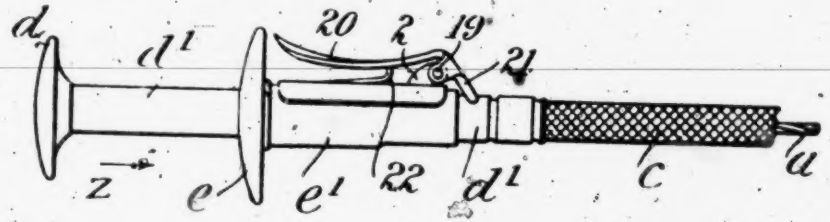


Fig. 15.

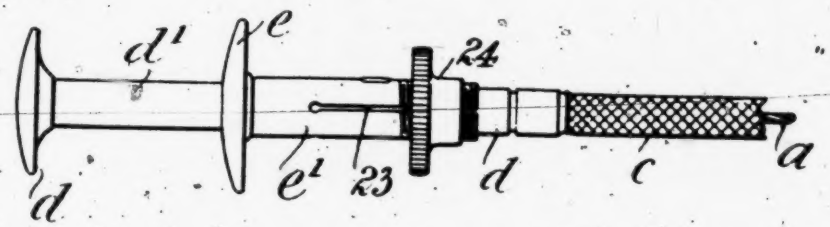


Fig. 16.

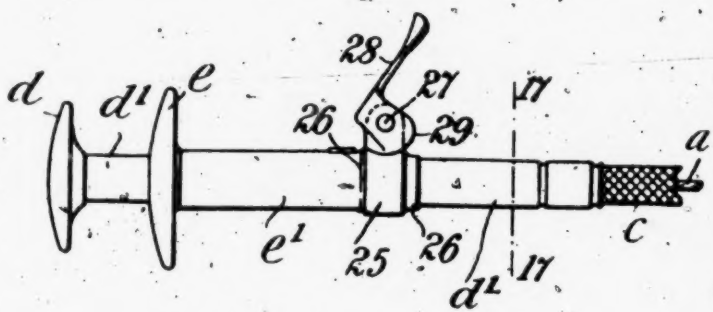
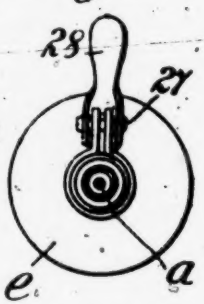


Fig. 17.



Malby & Sons, Photo-Litho

N° 5741. A.D. 1906

Date of Application, 9th Mar., 1906

Complete Specification Left, 10th Sept., 1906—Accepted, 7th Mar., 1907

PROVISIONAL SPECIFICATION.

"Improvements in or relating to Apparatus or Mechanism for the Transmission of Power in Varying Directions".

We, ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London, Engineer: and CHARLES HENRY WATSON, of 313 High Holborn, London, Optician: do hereby declare the nature of this invention to be as follows:—

This invention relates to apparatus or mechanism for the transmission of power in varying directions.

Apparatus or mechanism for the transmission of power in varying directions is well-known comprising two or more members one of which is slidable longitudinally upon or in or with respect to the other or others and such mechanism has among other uses been specially constructed and arranged as the "release" or means for operating (*i.e.* either opening or closing or releasing) photographic shutters see for example Edwards' Patents Nos. 12659 and 12813 both of 1901 and Edwards & Watsons' Patents Nos. 5047 and 28792 of 1903; and Nos. 13157 and 15645 both of 1905 and also see Bowden's Patent No. 25326 of 1896 this invention being especially applicable to any such apparatus or mechanism wherein the plaited outer cover or outermost cover of braid or a textile material is employed; all of which forms of outer cover we will for the sake of brevity refer to as "the "braided outer cover".

Now the present invention relates more especially to the attachment of the ends of said braided outer cover to the parts of the mechanism by which the said ends are to be held and secured and means for effecting such attachment, a further object being to enable said attachment to be simply quickly and cheaply effected and in suchwise that the extreme ends of said braided outer cover are concealed or entirely enclosed so as to thereby produce a neat and finished appearance of the mechanism at said points of attachment as well as to effect a strong and reliable attachment at each end of said braided outer cover.

For the sake of example we will now proceed to describe our present invention as carried into practice in conjunction with mechanism of the aforesaid character as follows:—

Taking the case of a photographic release wherein the innermost member consists of a wire adapted to be forced through an open coiled intermediate member with a braided outer cover or stocking (such as referred to in our aforesaid Patents Nos. 13157 and 15645 of 1905):—

(1) Towards the opposite end of the mechanism to that end which carries the push-button the end of the braided outer cover has a sleeve slid thereover which sleeve either carries or is formed on or attached to the means by which the mechanism is attached to the photographic shutter or other part or thing to be operated and after thus passing said sleeve *viz.* a little distance along the braided outer cover then an inner sleeve with a flared outer end is passed inside said end of the braided outer cover and thereupon the said outer sleeve is then slid back along the braided outer cover and over said flared inner sleeve so as to lock or securely hold this end of the braided outer cover therein-between.

[*Price 8d.*]

(2) Towards that end of the mechanism carrying the push-button the end of the braided outer cover is passed over an inner sleeve which surrounds the said open coiled member or intermediate member the outer end of said sleeve being flared or bell-mouthed and then another sleeve which is also flared to a still greater extent and of larger size than the inner sleeve is slid over the stocking and inner sleeve and grips and holds this end of the braided outer cover.

The inner end of the push-button (carrying the innermost member of the mechanism) having been placed in position inside the inner sleeve and open coiled member a finishing washer or cap loose on the shank of the push-button is then brought up into position against the flared ends of the two sleeves and secured thereto in any suitable manner advantageously by binding crimping or beading or turning in or folding the edge of said finishing washer or cap over the edges of the flared outer sleeve so that these two parts are permanently joined together and this completes the joint or attachment at this end of the release.

At both ends therefore the end of the braided outer cover is tightly wedged together and held in between the aforesaid sleeves in suchwise that the greater the pull or tractive force exerted the greater the hold.

As an additional security the exterior surface of the last-named flared inner sleeve (as also the aforesaid inner sleeve at the other end) may be corrugated ridged roughened screw-threaded or the like so as to thereby the better grip and hold the end of the braided cover wedged or forced against same by the outer sleeve.

As a modification the inner sleeve at the push-button end of the mechanism may be formed with a larger flared end than the outer flared sleeve or thimble so that when the two sleeves have been placed in position with the end of the braided outer cover secured between them thereafter the edges of the two said sleeves may be secured together by any suitable means such as crimping beading folding or binding same together in any suitable manner and in this case the push-button is prevented from coming out of said sleeves by means of the innermost member of the mechanism which is attached at one end to said push-button and at the other to a plunger or enlarged part which is adapted to act as a stop and limit the return movement of said innermost member and push-button thereon a suitable spring or springs being interposed and if desired the said inner sleeve may be provided with any suitable means such as an annular inset or in-turned edge to form a stop for said spring as also for the open coiled member.

Similarly at the opposite end of said release the parts between which the end of the braided cover is secured may be locked together by any suitable means as aforesaid.

The said inner sleeve at either end (upon which the braided outer cover is secured as aforesaid) may either be of thin metal tubing flared at the outer end as aforesaid or may be of any other suitable construction as for example it may be a coiled wire or wires which are formed with a flared outer end to act in a similar manner to the said flared tubing.

Furthermore either the auxiliary spring when employed or the open coiled intermediate member of the mechanism may have the end thereof secured as with the end of the braided outer cover namely in between the said sleeves.

For carrying out the invention in conjunction with mechanism for transmitting power by traction on the innermost member instead of by pressure thereon as aforesaid the intermediate member must be incompressible namely it may be a closely coiled wire while the braided outer cover in this case is secured between two sleeves the inner one of which is expanded (by any suitable expanding tool) against the inside of the outer sleeve after the parts have been placed in position with the end of the braided outer cover therein-between and said outer sleeve is prolonged and terminating in a head or button said prolonged part of said sleeve being slotted so as to permit the operation

device (to which the innermost member is attached) to slide in said slotted part.

The inner sleeve is provided with a swelling or other means to form an annular shoulder or stop against which the intermediate incompressible member bears or said inner end of the intermediate member may be passed in between the two sleeves and there locked and securely held by fastening same therein-between.

At the other end the braided outer cover may advantageously be secured between the two sleeves which are permanently secured to one another as aforesaid or same may be secured by inserting the end of the braided outer cover and the end of the intermediate incompressible member within an outer sleeve and then screwing inside said intermediate member and braided outer cover a screw plug of tapering form so as to firmly lock and hold the parts together at this end.

Dated this 9th day of March 1906.

TONGUE & BIRKBECK,
Agents for the Applicants.

COMPLETE SPECIFICATION.

"Improvements in or relating to Apparatus or Mechanism for the Transmission of Power in Varying Directions".

We, ARTHUR HENRY EDWARDS, of 96 Lordship Road, Stoke Newington, London; Engineer: and CHARLES HENRY WATSON, of 313 High Holborn, London; Optician: do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to apparatus or mechanism for the transmission of power in varying directions.

Apparatus or mechanism for the transmission of power in varying directions is well-known comprising two or more members one of which is slidable longitudinally upon or in or with respect to the other or others and such mechanism has among other uses been specially constructed and arranged as the "release" or means for operating (*i.e.* either opening or closing or releasing) photographic shutters see for example Edwards' Patents Nos. 12639 and 12812 both of 1901 and Edwards & Watson's Patents Nos. 5047 and 28792 of 1903; and Nos. 13157 and 15645 both of 1905 and also see Bowden's Patent No. 25325 of 1896; this invention being especially applicable to any such apparatus or mechanism wherein a plaited outer cover or outermost cover of braid or a textile material is employed; all of which forms of outer cover we will for the sake of brevity hereinafter refer to as the "braided outer cover".

Now the present invention relates more especially to the attachment of the ends of said braided outer cover to the parts of the mechanism by which the said ends are to be held and secured and means for effecting such attachment, a further object being to enable said attachment to be simply quickly and cheaply effected and in suchwise that the extreme ends of said braided outer cover are concealed or entirely enclosed so as to thereby produce a neat and finished appearance of the mechanism at said points of attachment as well as to effect a strong and reliable attachment at each end of said braided outer cover.

And in order that our present invention may be easily understood and readily carried into practice we will—with reference to the accompanying drawings—now proceed to describe same as carried into practice in the case of a photographic "release" wherein the innermost member consists of a wire enclosed

by an open-coiled intermediate member with a braided outer cover or stocking such as referred to in our aforesaid Patents Nos. 13157 and 15645 both of 1905.

Referring to the accompanying drawings:—

Each figure respectively is a longitudinal sectional view or part view of such mechanism as aforesaid, showing the present invention applied thereto; and similar letters of reference indicate similar parts throughout.

Towards the end B of the mechanism (which is opposite to the end A which carries the push-button *a*) the end of the braided outer cover *b* has a sleeve *c* slid thereover which sleeve either carries the means such as the four spring prongs *d* of the well-known type such as shown in Fig. 1 by which the mechanism is attached to the photographic shutter (or other part or thing to be operated) or said sleeve *c* may be attached to said means for example as shown in Fig. 2 by spinning or turning in the edge c^1 thereof over the flange c^1 of the inner sleeve *e* which latter by means of its screw-threaded outer end e^2 serves to attach the mechanism to the shutter *etc.*; or, as shown in Fig. 3, the sleeve *c* may be formed with the enlarged end c^2 which is internally screw-threaded and forms the means (integral with the sleeve *c*) for attaching the mechanism to the shutter *etc.* After thus passing said sleeve *c*, a little distance along the braided outer cover *b* then an inner sleeve *e* with a flared outer end e^1 as shown in Fig. 1 (or a flared part e^1 as shown in Fig. 2) is passed inside said end of the braided outer cover *b* and thereupon the said outer sleeve *c* is then slid back along the braided outer cover *b* and over said flared inner sleeve *e* so as to lock or securely hold this end of the braided outer cover *b* thereinbetween.

In Fig. 3—the inner sleeve *e* instead of being flared at its outer end is reduced at its inner end so as to form a shoulder or tapering part e^3 between which and the corresponding shoulder or taper c^3 on the inside of the sleeve *c* the braided outer cover *b* is locked and securely held as aforesaid.

Referring now more particularly to Figs. 1 and 2:—

Towards the end A of the mechanism carrying the push-button *a* the end of the braided outer cover *b* is passed over an inner sleeve *f* which surrounds the said open coiled member or intermediate member *g* the outer end f^1 of said sleeve *f* being flared or bell-mouthed; and then another sleeve *h* which is also flared to a still greater extent and of larger size than the inner sleeve *f* f^1 is slid over the stocking *b* and inner sleeve *f*, and grips and holds this end of the braided outer cover between same

The inner end of the push-button or shank *k* of said push-button (carrying the innermost member *i.e.* the wire *i* of the mechanism) having been placed in position inside the inner sleeve *f* and open coiled member *g*, then in the arrangement shown in Fig. 1 a finishing washer or cap *j* (loose on the shank *k* of the push-button *a*) is then brought up into position against or towards the flared ends f^1 and h^1 of the two sleeves *f* and *h* and secured thereto in any suitable manner advantageously by binding crimping or beading or turning-in or folding the edge of said finishing washer or cap *j* over the edge h^1 of the flared outer sleeve *h* so that these two parts are permanently joined together and this completes the joint or attachment of these parts at this end of the release; or this may be effected as illustrated in Fig. 2 by turning the flared outer edge f^1 of the inner sleeve *f* over the edge h^1 of the outer sleeve *h*.

At both ends therefore the end of the braided outer cover *b* is tightly wedged and held in between the aforesaid sleeves in suchwise that the greater the pull or tractive force exerted the greater the hold; and furthermore both the said ends are thereby concealed thus producing a neat finish.

As an additional security the exterior surface of the flared inner sleeve *f*—as also the aforesaid inner sleeve *e* at the other end—may be corrugated, ridged, roughened, screw-threaded, or the like, so as thereby the better to grip and hold the end of the braided cover *b* wedged or forced against same by the outer sleeves *h* and *c* respectively.

In the case illustrated in Fig. 2—the shank *k* of the push-button is prevented from coming out of said sleeves *f* and *h* by means of the innermost member *i* of the mechanism which is attached at one end to said push-button *a* and at the other to a plunger or enlarged part *l* the inner end l^1 of which bears against the inwardly projecting annular ledge e^1 on the sleeve *e* (Fig. 2) and will consequently act as a stop and limit the return movement of said innermost member *i* and push-button *a* thereon; a suitable spring a^2 (or springs) being provided to normally keep the push-button *a* pressed outwards; the said inner sleeve *f* (Fig. 2) being provided with any suitable means such as an annular inset f^2 or in-turned edge to form a stop for said spring a^2 as also for the open-coiled member *g*.

In Fig. 3 a modified arrangement is shown in which the inner sleeve *f* is formed of an open-coiled wire which is flared at the end f^1 and the outer sleeve h^1 acts as in Fig. 1 and has the cap *j* secured thereto also as in Fig. 1.

In this arrangement (Fig. 3) one end of the auxiliary spring *x*—and in Fig. 1 one end of the open-coiled spring *q* forming the intermediate member *g*—bears on the enlargement k^1 on the shank *k* of the push-button *a* and the other end of this spring *x* (Fig. 3) bears against the inside of the thimble or short sleeve *y* located within the said inner sleeve *f* of coiled wire; the object of this arrangement in each case being to normally keep the push-button *a* pressed outwards; such outward movement however being limited by means of the inturned edge j^2 (of the cap *j*) against which bears the shoulder k^2 on the said enlarged part k^1 of the shank *k* which thereby acts as a stop.

At the end B of said release the parts between which the end of the braided cover *b* is secured may be locked together by any of the hereinbefore described means or by any other suitable means as aforesaid.

The said inner sleeves *e* and *f* at either end (upon which the braided outer cover *b* is secured as aforesaid) may either be of thin metal tubing flared at the outer end as aforesaid as in Fig. 1 or may be of any other suitable construction as for example it may be a coiled wire (as illustrated in Fig. 3) or wires which are formed with a flared outer end to act in a similar manner to the said flared tubing.

Furthermore either the auxiliary spring when employed, or the open-coiled intermediate member *g* of the mechanism, may have the end thereof secured with the end of the braided outer cover *b* namely in between the said sleeves.

Figs. 4 to 7 illustrate various modifications in attaching the braided outer cover *b* at the push-button end of the mechanism.

Referring now to Fig. 4:—

In this arrangement the inner sleeve is formed by a coiled wire *f* expanded or flared towards its end f^1 as in Fig. 3 but in this case the cap *j* (to which the outer sleeve *h* is attached as in Figs. 1 and 3) is provided with an inwardly extending tubular part j^1 which is advantageously corrugated or spirally ridged to fit the convolutions of the coiled wire forming the end f^1 of the inner sleeve *f*; between which inner portion j^1 and the flared outer sleeve *h* the end of the braided outer cover is securely held as aforesaid.

Referring now to Fig. 5:

In this arrangement the outer sleeve *h* is prolonged and at its inner end h^2 is tapered inwardly *i.e.* is of reduced diameter between which inwardly tapering end h^2 and the conical or tapering sleeve *m* the braided outer cover is firmly secured by wedging action as aforesaid; the other end of the outer sleeve *h* being secured to and by a cap *j* while the shank *k* of the push-button *a* is provided with an annular swelling k^3 which serves as an abutment to act against the stop formed by the inwardly turned edge j^2 on the cap *j* as in Figs. 1 and 3.

x is the auxiliary spring which tends to keep the push-button *a* normally pressed outwards.

In the arrangement shown Fig. 6:—

The braided outer cover *b* is held securely between the inwardly tapering end h^2 of the outer sleeve *h* and the inner sleeve *f* which latter does not extend to the cap *j* in this case but is of short length and terminates at f^2 in the larger part of the outer sleeve *h*; the cap or part *j* in this case having a sleeve portion j^2 adapted to slide freely on the exterior of the sleeve *h* and having fixed thereto a cross-bar j^3 adapted to slide in the slotted portion h^3 of the sleeve *h*, which sleeve *h* in this case is prolonged and terminates at its extreme end in the push-button *a*.

To the said cross-bar j^3 is attached the inner end of the wire *i* forming the innermost member of the mechanism, and one end of the spring *x* is also attached to said bar j^3 and at its other end this spring *x* is fixed in the short thimble *u* which is cramped and locked in the position shown in Fig. 6 between said spring *x* and the open coiled outer member *g* of the mechanism.

Referring now to Fig. 7:—

This shows a somewhat similar arrangement to Fig. 6 the braided outer cover *b* being securely held in between the tapering end h^2 of the outer sleeve *h* and the inner sleeve *f* (which is a short sleeve terminating at f^2 after the manner shown in Fig. 6) the end of the open coiled wire *g* (forming the intermediate member) in this case being shown flared, and this flared end located between the tapering portion of the inner sleeve *f* and the tapering portion of the outer sleeve *h*—which latter is prolonged as in Fig. 6 and has the button *a* formed on the end thereon; the device *j* in this case (as in Fig. 6) having a tubular portion j^2 adapted to slide on the exterior of the sleeve *h* and having a cross-bar j^3 travelling in the slot h^3 in the sleeve *h* to which cross-bar j^3 one end of the wire *i* is fixed the said device *j* being normally kept pressed away from the button *a* by means of the interposed auxiliary spring a^4 as shown in said Fig 7.

In transmitting power by traction on the innermost member the intermediate incompressible member may be a closely coiled wire while the braided outer cover in this case is secured between two sleeves the inner one of which is expanded (by any suitable expanding tool) against the inside of the outer sleeve after the parts have been placed in position with the end of the braided outer cover thereinbetween and said outer sleeve is prolonged and terminates in a head or button said prolonged part of said sleeve being slotted so as to permit the operating device (to which the innermost member is attached) to slide in said slotted part.

The inner sleeve is provided with a swelling or other means to form an annular shoulder or stop against which the intermediate incompressible member bears or said inner end of the intermediate member may be passed in between the two sleeves and there locked and securely held by fastening same thereinbetween.

At the other end the braided outer cover may advantageously be secured between the two sleeves which are permanently secured to one another as aforesaid or same may be secured by inserting the end of the braided outer cover and the end of the intermediate incompressible member within an outer sleeve and then screwing inside said intermediate member and braided outer cover a screw plug of tapering form so as to firmly lock and hold the parts together at this end.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. In apparatus or mechanism for the transmission of power in varying directions of the character referred to and having a braided outer cover of the character referred to, the herein described means for securely attaching the end of said braided outer cover said means comprising an outer sleeve of tapering form or shouldered or stepped internally and an inner sleeve of tapering form or shouldered or stepped externally and between which said braided outer

cover is gripped and held substantially in the manner and for the purposes hereinbefore described.

2. The herein described apparatus or mechanism for the transmission of power in varying directions with means to securely hold the end of the braided outer cover all substantially in the manner and for the purposes hereinbefore described with reference to and as illustrated in Fig. 1, or Fig. 2, or Fig. 3, or Fig. 4, or Fig. 5, or Fig. 6, or Fig. 7, of the drawings hereunto annexed.

Dated this 8th day of September 1906.

TONGUE & BIRKBECK,
Birkbeck Bank Chambers, Chancery Lane, London, W.C.,
Agents for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1907.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

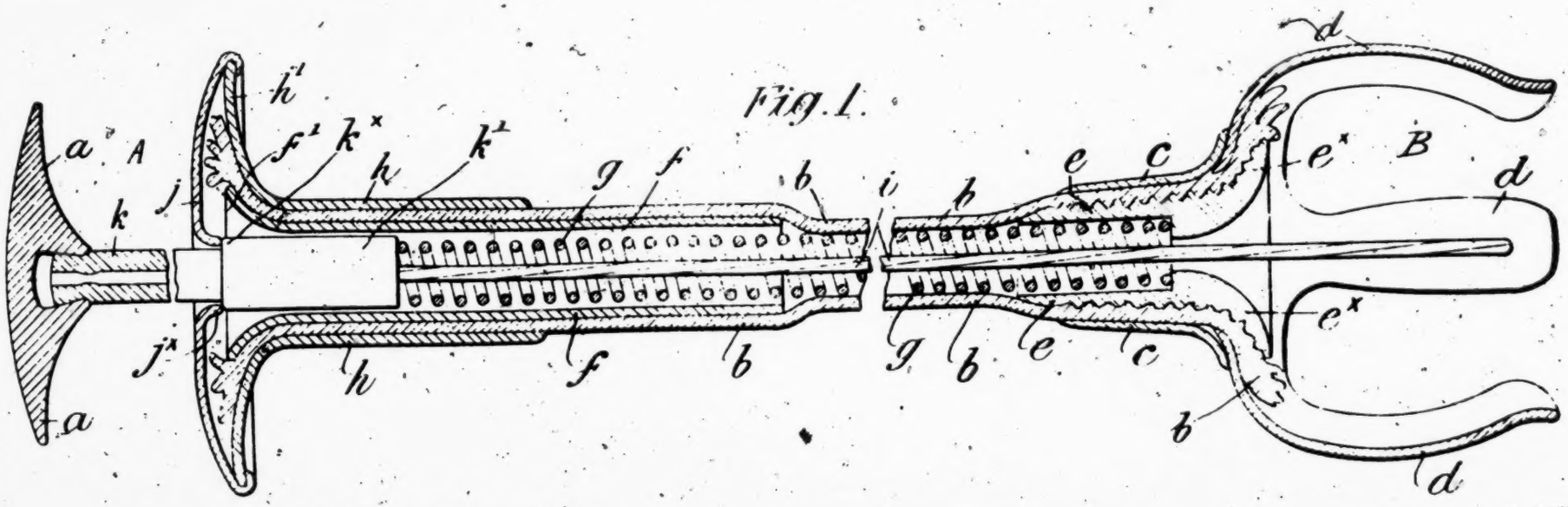
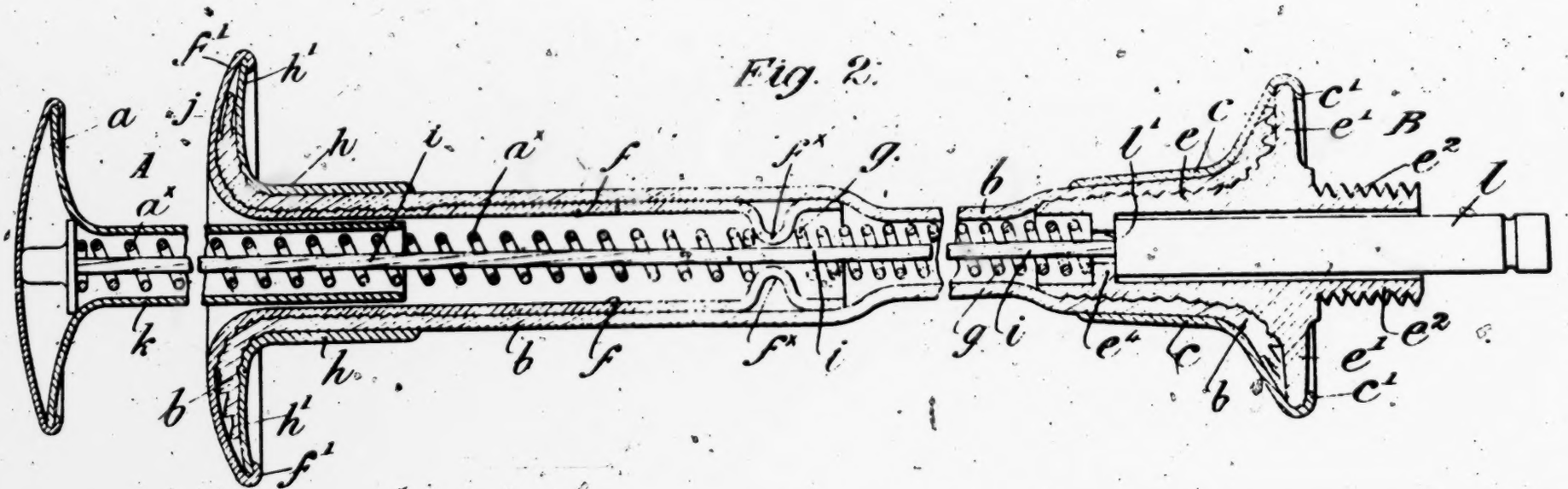


Fig. 2.



[This Drawing is a reproduction of the Original on a reduced scale.

Fig. 3.

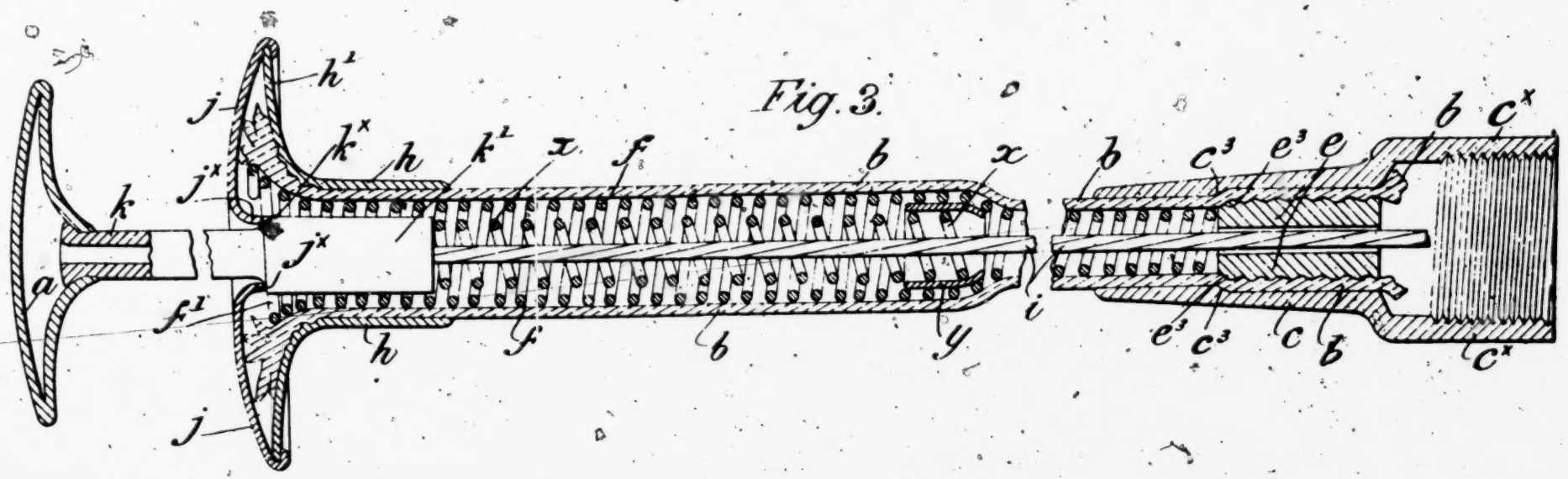
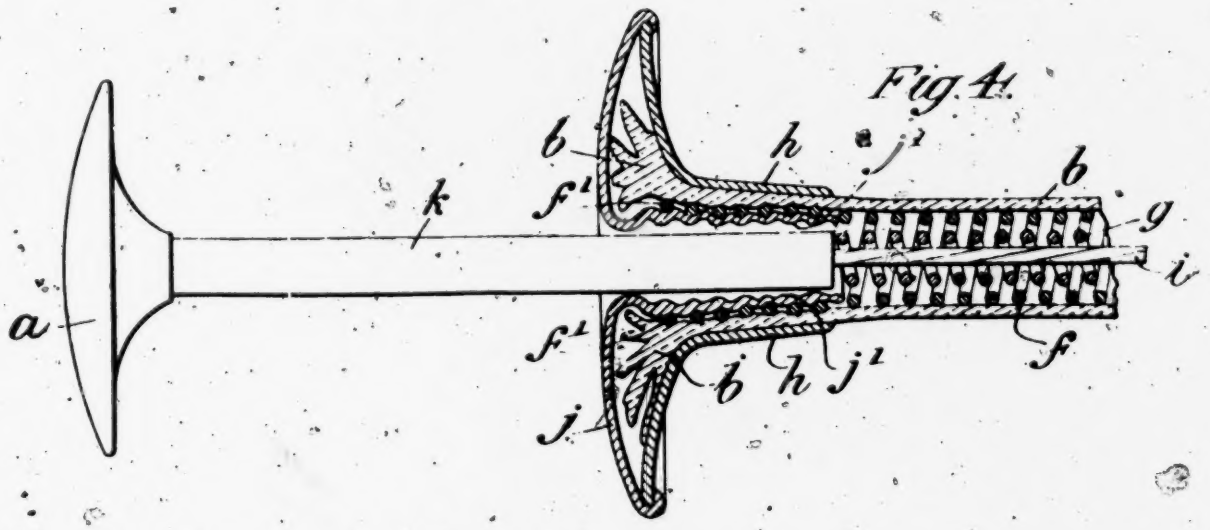


Fig. 4.



A.D. [illegible] No. 511

[illegible] Complete Specification.

Fig. 5.

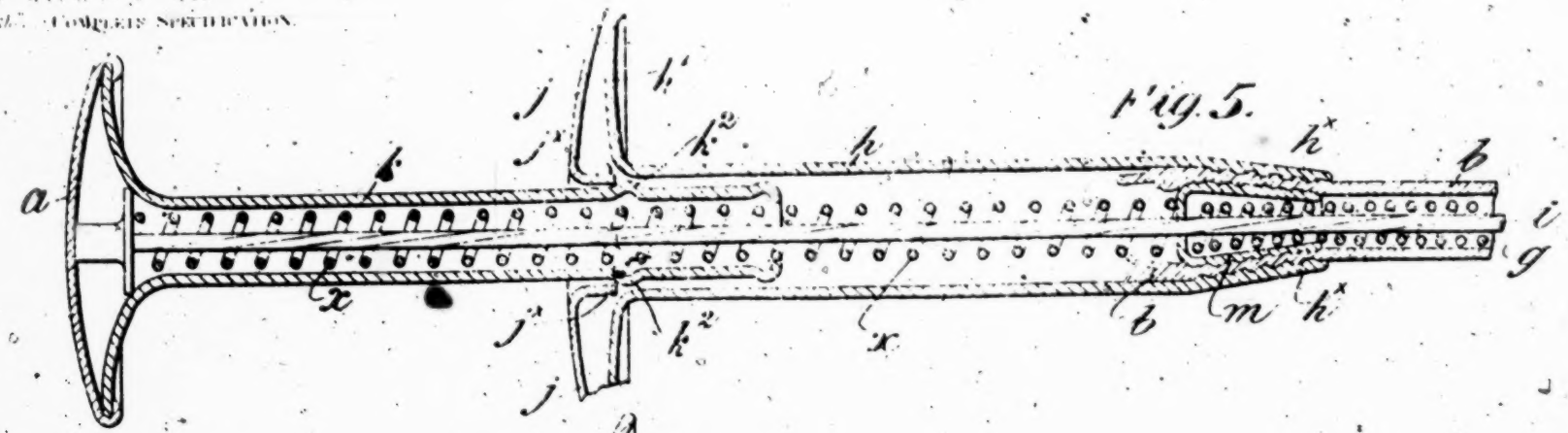


Fig. 6.

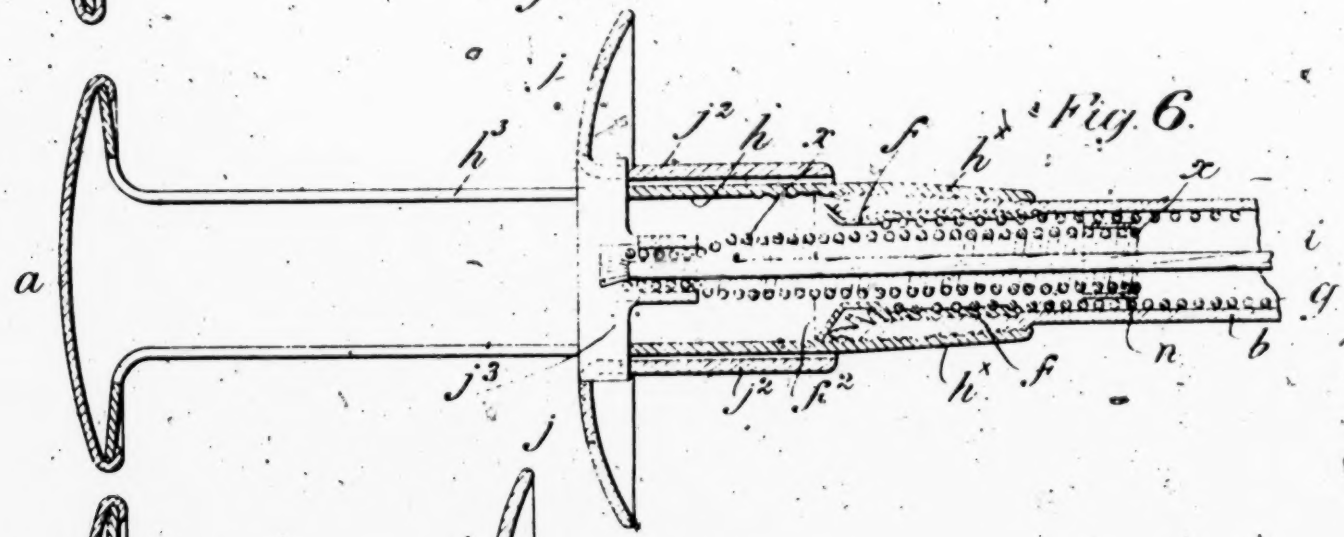
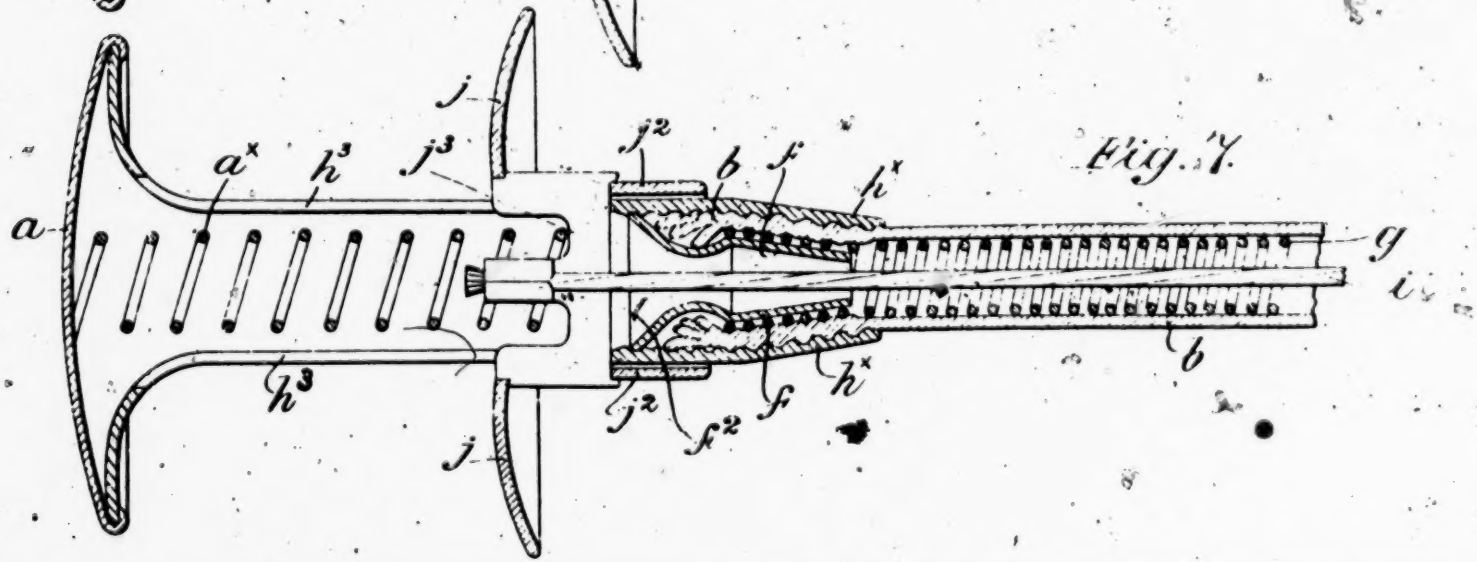


Fig. 7.



KAISERLICHES PATENTAMT.

PATENTSCHRIFT

№ 147572

KLASSE 47b.

ALFRED WERMANN IN DRESDEN.

Vorrichtung zur Übertragung von Druckkraft.

Patentiert im Deutschen Reiche vom 28. Mai 1902 ab.

Es sind Vorrichtungen zum Übertragen des Druckes bekannt, bei denen in einem rohrförmigen, unzusammendrückbaren, aber biegsamen Führungsgliede ein Übertragungsglied frei durchgeführt wird. Als Übertragungsglied wählte man ein Drahtseil oder eine Reihe aneinander stoßenden Stifte. Um nun die Genauigkeit der Arbeit derartiger Vorrichtungen zu erhöhen, ist nach dieser Erfindung als Übertragungsglied eine unzusammendrückbare Drahtschraube im Führungsglied angeordnet.

Die Vorrichtung ist in der Zeichnung dargestellt, und zwar zeigt:

Fig. 1 die Ansicht derselben,

Fig. 2 den Druckempfänger im Schnitt.

Eine Schraubenfeder *a* ist an ihren Enden mit den Hülsen *b* und *c* fest verbunden. In dieser Schraubenfeder *a* liegt eine zweite *d*, die einerseits mit dem Druckempfänger *g*, andererseits mit dem Druckerteiler *f* fest verbunden ist. Der Druckempfänger *g* ist in der Hülse *b* unter Überwindung des Druckes der Feder *h*, der Druckerteiler *f* in der Hülse *c* verschiebbar, so daß also bei Erteilung eines Druckes auf den Druckempfänger *g* die Drahtschraube *d* sich in der Drahtschraube *a* verschiebt und so den Druck bei *f* auf irgend einen Gegenstand ausüben kann, ohne daß die Zwischenleitung zwischen *g* und *f* eine bestimmte Lage einzunehmen braucht.

Soll der Druck durch den Finger ausgeübt werden, wie z. B. bei den Auslösevorrichtungen an photographischen Apparaten, so kann an der Druckerteilungsstelle ein Handteller *i* oder dergl. angeordnet sein, der der Hand als Widerlager dient.

Patent-Anspruch:

Vorrichtung zur Übertragung von Druckkraft, bestehend aus einem rohrförmigen, unzusammendrückbaren, aber biegsamen Führungsgliede und einem durch dieses frei hindurchführenden Übertragungsgliede, dadurch gekennzeichnet, daß das Übertragungsglied aus einer unzusammendrückbaren Drahtspirale gebildet ist.

Hierzu 1 Blatt Zeichnungen.

ALFRED WERMANN IN DRESDEN.

Vorrichtung zur Übertragung von Druckkraft.

Fig. 1.

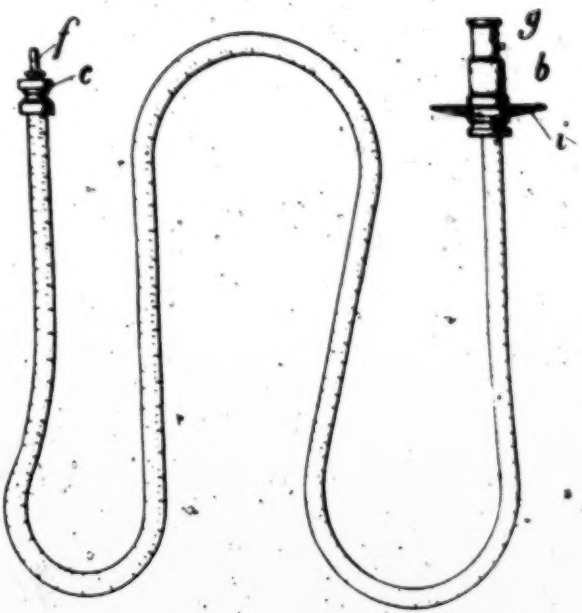
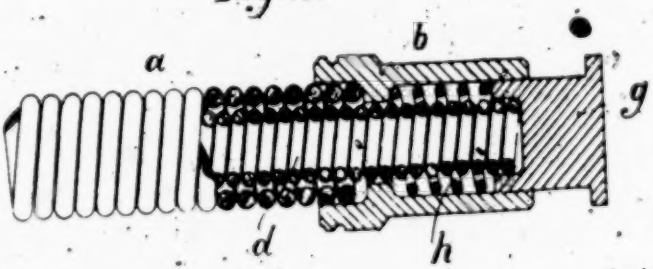


Fig. 2.



Zu der Patentschrift

№ 147572.

PHOTOGR. DRUCK DER REICHSDRUCKEREI

TRANSLATION OF GERMAN PATENT 147,572
Alfred Wermann
MEANS FOR THE TRANSMISSION OF PRESSURE
Patented in Germany, May 28, 1902.

Devices for transferring pressure are known in which a transmission member is led through a tubular, non-compressible but flexible guiding member. As a transmission member, a wire cable or a row of abutting pins have been used. In order to increase the precision of the operation of devices of that type, there is used in accordance with the present invention as the transmission member a non-compressible wire spiral which is arranged within the guide member.

The device is shown in the drawing in which:

Figure 1 is a side view thereof,

Figure 2 the "pressure transferer" in cross-section.

A spiral spring a is fastened at its ends to the sleeves b and c. Within this spiral spring a is a second spring d, which at one end is fastened to the plunger g and on the other end to a thrust member f. The plunger g is displaceable in the sleeve b by overcoming the counter-pressure exerted by spring h, and the thrust member f is displaceable in the sleeve c, so that when pressure is applied to the plunger g the wire spiral d is displaced within the wire spiral a and thereby the thrust member f can exert a pressure on any object without the conducting member between g and f having to occupy any predetermined position.

If the pressure is to be exerted by the finger, as for example in releasing a shutter of photographic apparatus, a small fixed finger grip i or the like may be provided near the point where the pressure is applied, which will serve as a support for the hand.

Patent claim:

Device for the transmission of pressure, consisting of a tubular, non-compressible, but flexible guide member and a transmission member freely extending through the former, characterized by the fact that the transmission member consists of a non-compressible wire coil.

[fol. 85] Clerk's Certificate to foregoing volume of exhibits omitted in printing.

Endorsed on cover: File No. 38,312. U. S. Circuit Court of Appeals, Third Circuit. Term No. 709. Eastman Kodak Company, Eastman Kodak Company of New York, and Eastman Kodak Stores, Inc., Petitioners, vs. Charles B. Gray. Petition for a writ of certiorari and exhibit thereto. Filed January 8, 1934. File No. 709, O. T., 1933.

(4508-C)